BC Centre for Disease Control
AN AGENCY OF THE PROVINCIAL HEALTH SERVICES AUTHORITY

STI

Annual Report 2011

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Preface

After previous gains in public health control of bacterial sexually transmitted infections (STIs), British Columbia is now experiencing a decade long increase in STI rates. Similar trends are also occurring in other jurisdictions with publically coordinated STI control programs. In addition, there is the challenge of emerging antimicrobial drug resistant gonorrhea, the re-emergence of once rarely seen infections such as lymphogranuloma venereum (LGV), and the recent sharp increase in syphilis infection among gay, bisexual and other men who have sex with men (MSM). At the same time, progress has been made in some areas of STI control, including the implementation of effective harm reduction and treatments which have reduced HIV incidence and the increased use of effective vaccines for human papillomavirus (HPV).

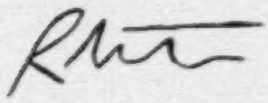
The basic tenets of STI control are primary prevention through making well-informed sexual decisions and harm reduction, and access to diagnostics and effective treatments to abate symptoms, reduce complications, and prevent ongoing spread to others. Critical to these approaches are the availability of cost effective testing, case detection strategies and tools, and accessibility to effective low threshold treatments. One key evidence-based approach for containing the spread of STIs is the testing and treatment of sexual partners which requires considerable coordination between individuals, their care providers, and public health.

This report describes surveillance data for reportable STIs in BC. While STIs are found in all populations, they are often found more commonly in specific populations. *Chlamydia trachomatis*, continues to be the most prevalent reportable STI in the province, is widespread among sexually active individuals of all ages and populations, but highest among young women and in Northern communities. Lymphogranuloma venereum (LGV), a particularly virulent form of chlamydia, has re-emerged over the past three years, primarily presenting as proctitis in MSM. *Neisseria gonorrhoeae* rates continue to rise, are most prominent among men, and appear more concentrated in highly sexually active networks. A major threat to gonorrhea control is increasing antimicrobial drug resistance. Cephalosporins are considered the last mainstay of outpatient treatment for gonorrhea, yet worrisome trends of resistance developing in this antibiotic class have been reported in BC and elsewhere in the world. As a result, important changes have been made and continue to evolve for treatment and control of gonorrhea cases. Keeping up to date with Canadian and BC STI treatment guidelines will be more critical than ever.

At BCCDC, we continue to incubate and innovate new approaches to STI prevention and care. These include ongoing monitoring of *N. gonorrhoeae* drug susceptibility (in collaboration with the BC Public Health Microbiology Reference Laboratory), centralized management and follow-up of syphilis and LGV cases, and exploration of mobile and online methods to reduce barriers to prevention, care and treatment. As one example of the latter, in 2012 we upgraded our sexual health website SmartSexResource.com which now provides online access to nurses, an interactive clinic finder, and up-to-date information for both providers and the populations of British Columbians they serve.

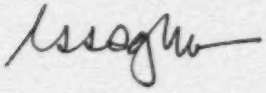
While these are exciting times for advances in HIV and HPV control with expanded treatment and availability of effective vaccines, respectively, extra vigilance will be required to reverse the worrisome trends in bacterial STI rates. This report describes the trends and demography needed to understand our epidemics and to strategize our population and public health responses. It should also provide the basic elements for health care providers to accurately inform their patients of their risks, and guide appropriate interventions and management.

Sincerely,



Dr. Richard Lester, Medical Head, STI/HIV Control

Dr. Mark Gilbert, Epidemiology and Surveillance



Dr. Gina Ogilvie, Medical Director

Clinical Prevention Services, BCCDC

Summary of Trends

Genital Chlamydia

In 2011, the rate of genital chlamydia decreased slightly to 255.5 per 100,000 population; however the overall provincial trend has been a steady increase since 1998.

- The highest rates are in Northwest, Northern Interior and Vancouver Health Service Delivery Areas.
- Females continue to have higher rates of genital chlamydia infection compared to males.
- The highest rates are among young adults (20-24 years; both genders) followed by adolescents (15-19 years), although there has been a levelling off of rates in these age groups in recent years.
- In 2011, there were 26 extra-genital infections identified, and 1 perinatally-acquired infection.
- An increase in lymphogranuloma venereum (LGV) was identified in 2011 (21 cases), attributed in part to routine testing of rectal chlamydia positive specimens for LGV and augmented case-finding. All cases were men who have sex with men, many of whom are co-infected with HIV.

Genital Gonorrhea

In 2011, the provincial rate of genital gonorrhea increased to 34.3 per 100,000 population, continuing an overall increase since 1998.

- The highest rates of infection are in Vancouver Coastal and Northern Health Authorities.
- Males have higher rates of infection compared to females, and in 2011 rates in males increased while rates have been more stable.
- The highest rates of infection are among males aged 20-24 and 25-29 years, with increase rates in all age groups. For females the highest rates are among females aged 15-19 and 20-24 years.
- In 2011, there were 115 extra-genital infections (majority being throat infections).
- Analysis of recent gonorrhea antimicrobial resistance trends in BC demonstrates a concerning decreased susceptibility for first-line treatments including cefixime, ceftriaxone and azithromycin. Canadian treatment guidelines are expected to evolve in response to these trends.

Pelvic Inflammatory Disease and Ectopic Pregnancy

In 2011, the rate of hospital admissions and physician billings for women related to pelvic inflammatory disease was stable or decreased, consistent with the overall decline in this potential complication of chlamydia or gonorrhea infection over the past two decades. While hospitalizations of women related to ectopic pregnancy has shown a similar trend, the number of physician billings has shown a small but steady increase since 2003 in BC.

Infectious Syphilis

In 2011, the provincial rate of infectious syphilis increased to 4.2 per 100,000 population, reversing a downward trend since 2008.

- The highest rates of infection are in Vancouver and South Vancouver Island Health Service Delivery Areas.
- In 2011, over 90% of cases were male, with highest rates observed in individuals between 25-59 years of age.
- 54% of cases were among people who identified as Caucasian. Rates of infectious syphilis among First Nations people in BC have decreased steadily since 2007.
- Men who have sex with men continue to comprise the greatest number of new infectious syphilis cases in BC (80% in 2011). Among MSM cases where HIV status is known, over 50% are co-infected with HIV.

Chlamydia

Genital Chlamydia by Region, Gender and Age

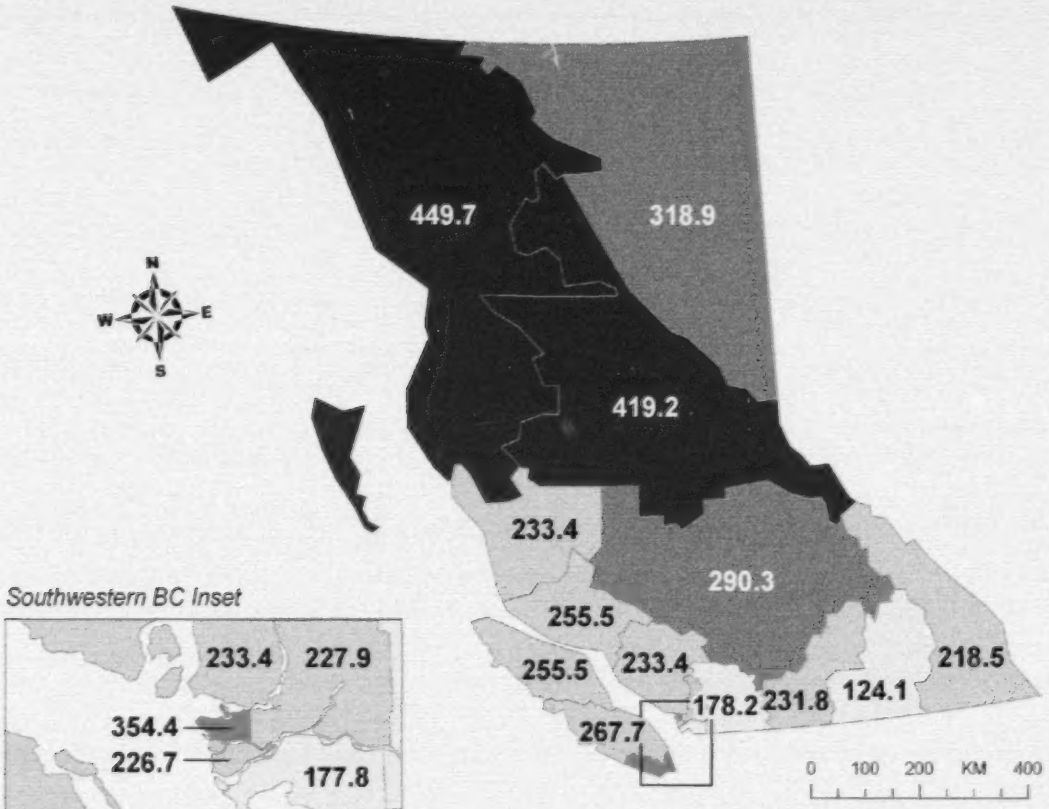
Genital chlamydia is the most commonly reported sexually transmitted infection in British Columbia. As the majority of chlamydia infections are asymptomatic the reported number of chlamydia infections are only a portion of the total population burden. If untreated, genital chlamydia may lead to complications such as pelvic inflammatory disease (a major cause of infertility, ectopic pregnancy and chronic pain) in women, and epididymo-orchitis in men.

Mirroring the national trend, genital chlamydia rates have steadily increased from 1998 until 2010, although these rates had declined for most of the 1990s (Figure 2). In 2011, the rate of genital chlamydia for BC decreased to 255.5 (11,730 cases) from 261.8 (11,846 cases) per 100,000 population in 2010. The highest annual rates of genital chlamydia are in Northern Health Authority (Figure 3); rates among Health Service Delivery Areas varied with the highest rates in Northwest, Northern Interior and Vancouver, and the lowest rates in Kootenay Boundary, Fraser East and Fraser South (Figure 1).

Similar increases in chlamydia infections have been observed in high income countries around the world. This increase is related to multiple factors, including changes over time in the sensitivity of laboratory tests and uptake (e.g., the greater acceptability of urine-based tests among men) and provider screening practices. This may also be a paradoxical effect of improvements in early screening and treatment for chlamydia over the past decades, resulting in individuals being less likely to develop full immunity and consequently more susceptible to re-infection (known as the "arrested immunity" hypothesis[1,2]) - a finding which is supported by decreased rates of complications of chlamydia infection (i.e., pelvic inflammatory disease or ectopic pregnancy) over this time period. While data on population trends in sexual behaviour is not available for BC, it is possible that changes in behaviour may also be contributing to increasing chlamydia incidence.

Females continue to have approximately twice the infection rate compared to males. However, the decline in rates for females in 2011 was slightly greater than the decline in males (Figure 4). Consistent with the data from 2002 to 2010, in 2011, the highest rates of chlamydia are among young adults aged 20-24 years followed by adolescents aged 15-19 years (Figure 6), influenced primarily by trends among females (Figure 7). Both of these age groups for females decreased in 2011, suggesting a possible levelling off of rates at younger ages. For males, those 20-24 years old and 25-29 years old have the highest chlamydia rates, with a slight increase in the 20-24 year old age group and a slight decrease in the 25-29 year old cohort in 2011 (Figure 8). The greater number of infections among females is partially due to routine screening performed at the time of visits that were for other reasons (e.g., pap testing or contraception counselling). The Public Health Agency of Canada currently recommends that all sexually active males and females under the age of 25 years be screened for chlamydia.

1. Genital chlamydia case reports in BC by health service delivery area, 2011



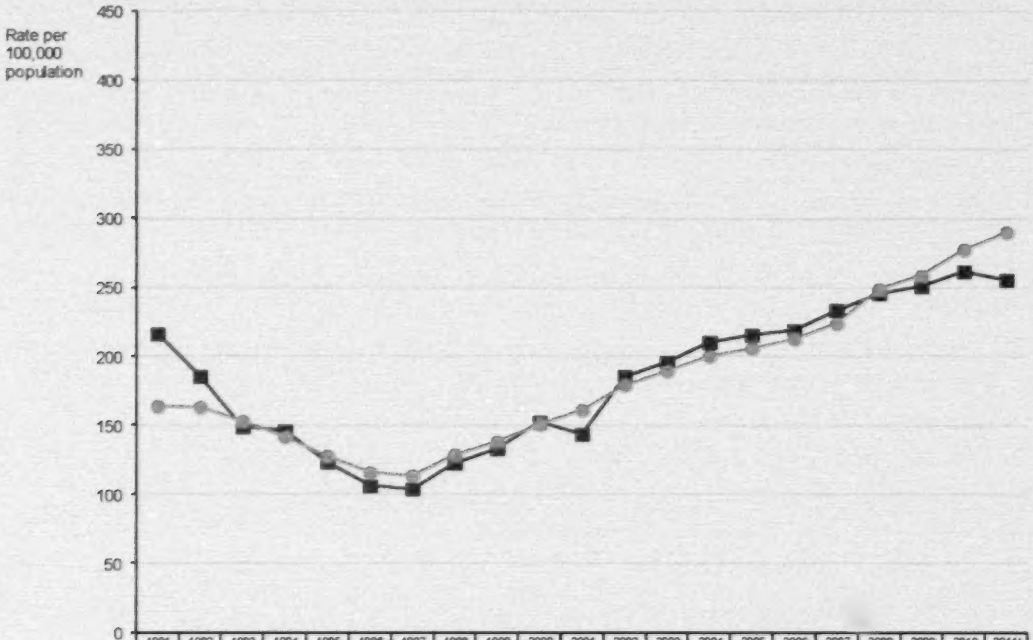
ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	176	218.5
12	Kootenay Boundary	99	124.1
13	Okanagan	818	231.8
14	Thompson Cariboo Shuswap	651	290.3
21	Fraser East	511	178.2
22	Fraser North	1405	227.9
23	Fraser South	1292	177.8
31	Richmond	448	226.7
32	Vancouver	2370	354.4
33	North Shore/Coast Garibaldi	671	233.4
41	South Vancouver Island	1048	279.7
42	Central Vancouver Island	712	267.7
43	North Vancouver Island	310	255.5
51	Northwest	340	449.7
52	Northern Interior	606	419.2
53	Northeast	224	318.9

Rate per 100,000 population by HSDA

- 124.1 - 178.2
- 178.3 - 267.7
- 267.8 - 354.4
- 354.5 - 449.7

Rates calculated with population estimates released by BC Stats

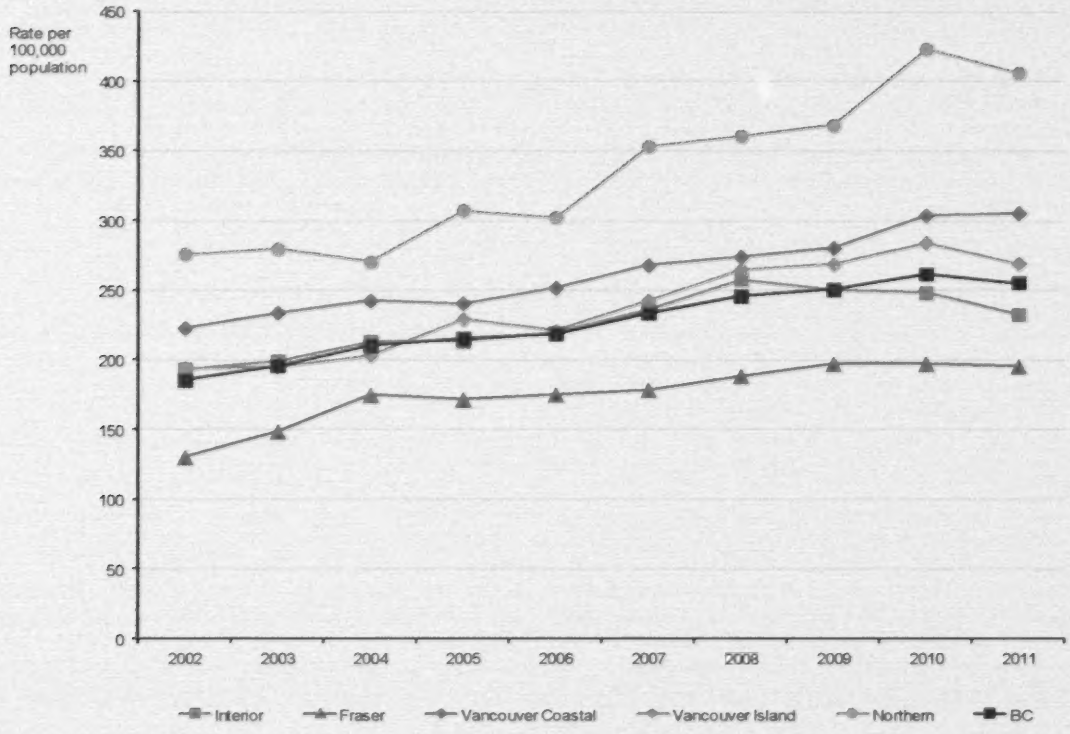
2. Genital chlamydia case reports in BC and Canada by historical trend, 1991 to 2011



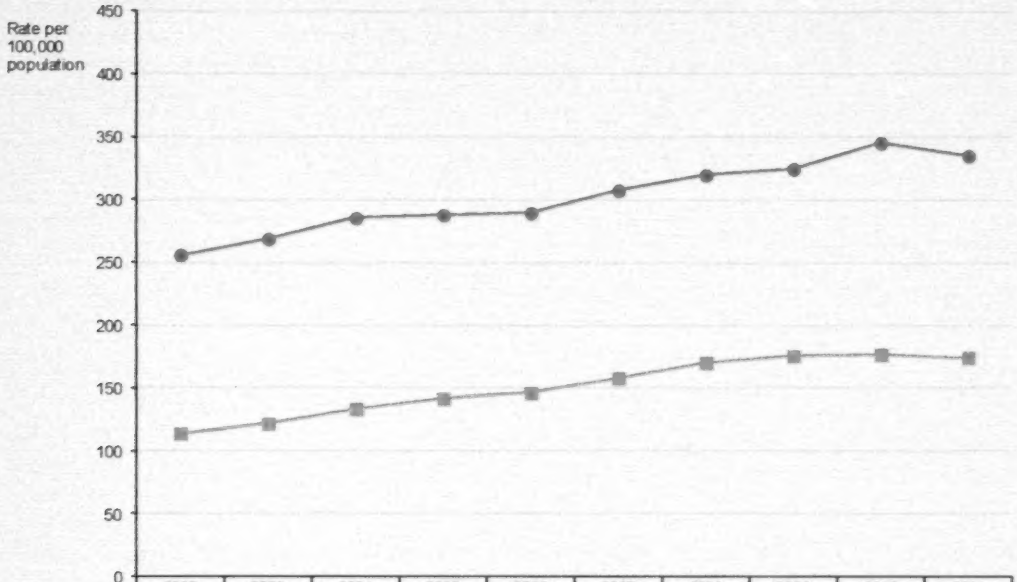
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011*
BC Reports	7,294	6,434	5,321	5,366	4,660	4,116	4,116	4,877	5,342	6,148	5,856	7,601	8,073	8,733	9,040	9,275	10,061	10,775	11,176	11,646	11,730
BC Rate	216.2	185.5	149.1	146.0	123.4	106.2	104.2	122.4	133.2	152.2	143.7	185.5	195.8	210.2	215.4	218.6	233.5	245.8	250.9	261.8	255.5
Canadian Rate	164.0	163.4	153.4	142.0	127.9	115.9	113.9	129.0	138.2	150.9	161.4	179.5	189.6	200.5	208.1	212.9	224.0	248.8	258.5	277.7	290.2

*2011 Canadian rate is preliminary and subject to change

3. Genital chlamydia case reports in BC by health authority, 2002 to 2011



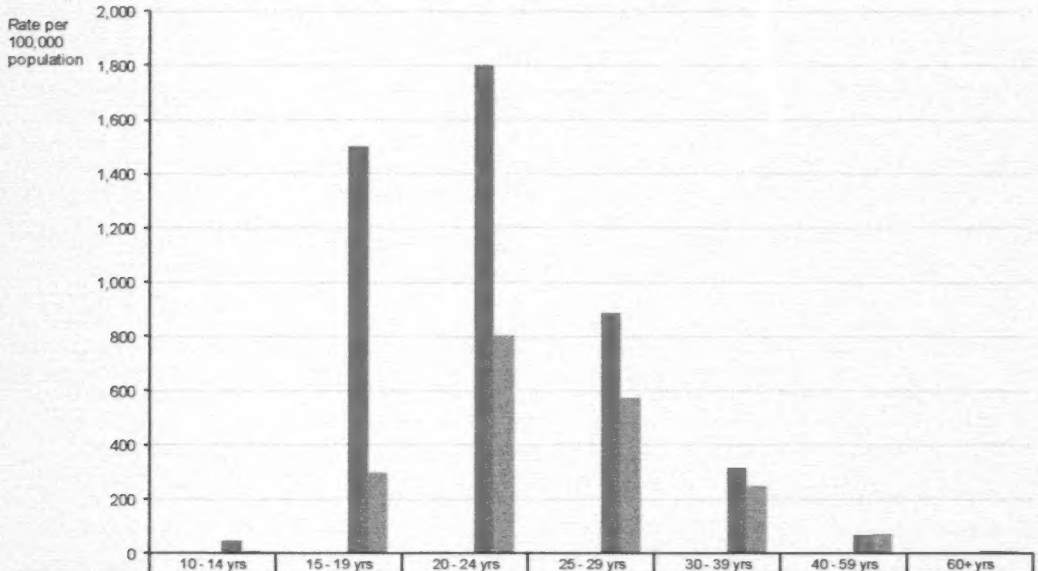
4. Genital chlamydia case reports in BC by gender, 2002 to 2011



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Reports - Female	5,287	5,587	5,984	6,094	6,198	6,683	7,066	7,287	7,872	7,752
Reports - Male	2,313	2,485	2,748	2,945	3,071	3,374	3,703	3,881	3,969	3,971
Reports - Other *	1	1	1	1	6	4	6	8	5	7
Rate - Female	255.9	268.7	285.4	287.8	289.4	307.4	319.7	324.6	345.3	335.1
Rate - Male	113.8	121.6	133.5	141.6	146.1	158.0	170.4	175.6	176.9	174.4

* Other - transgender and gender unknown

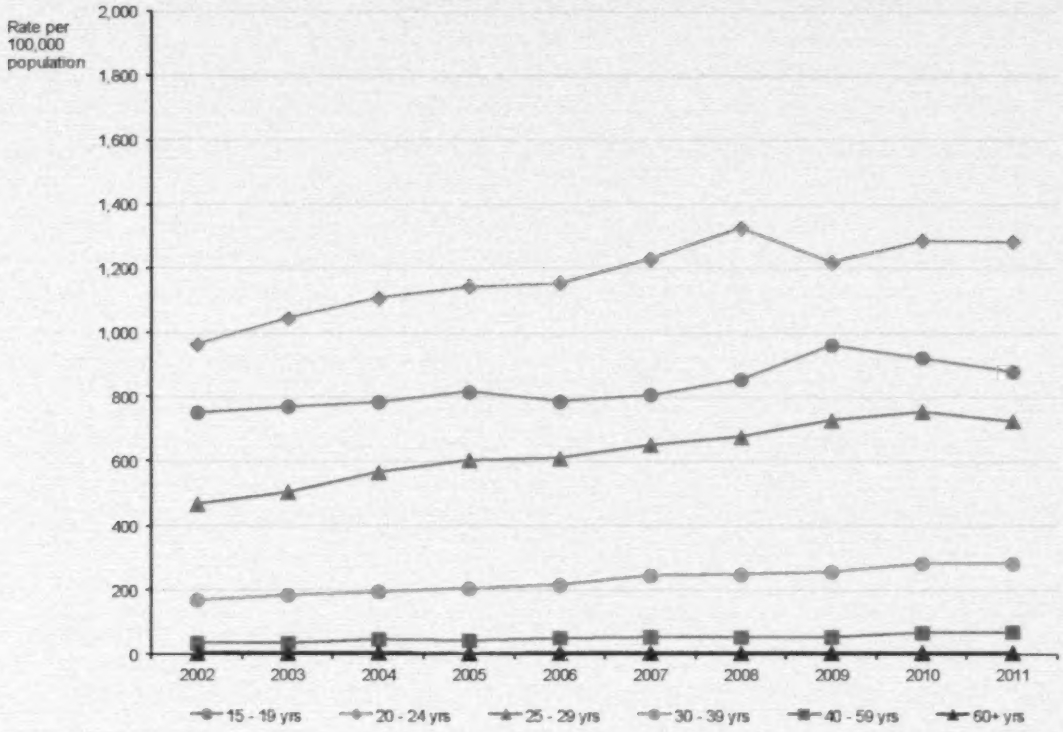
5. Genital chlamydia case reports in BC by age group and gender, 2011



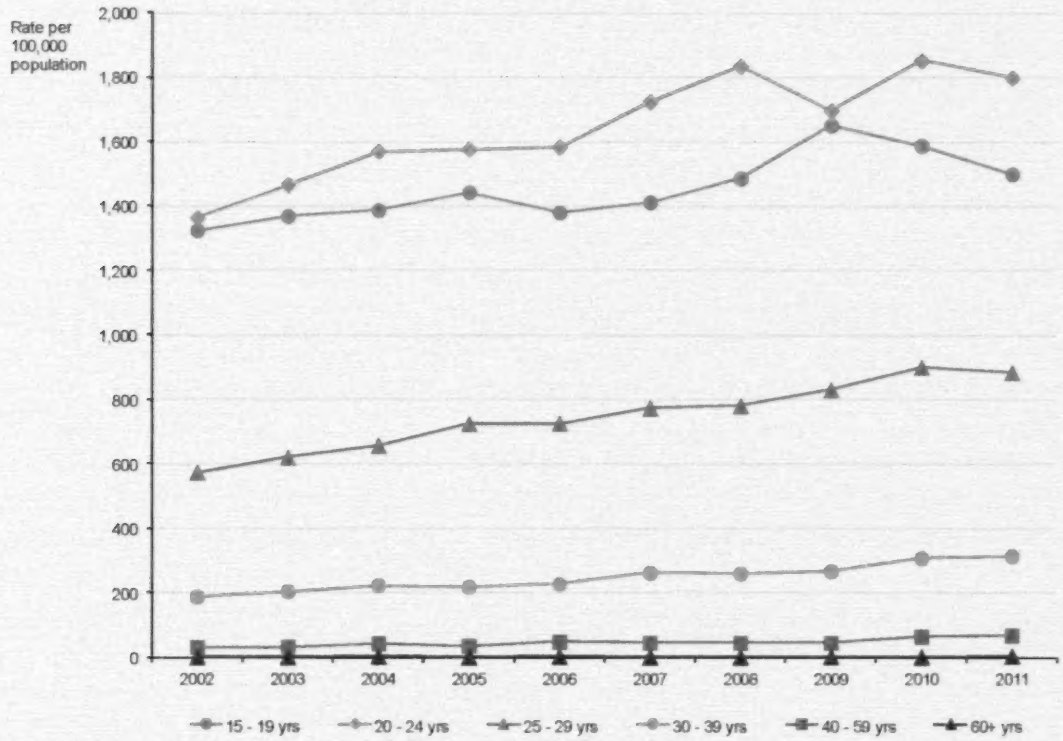
	10 - 14 yrs	15 - 19 yrs	20 - 24 yrs	25 - 29 yrs	30 - 39 yrs	40 - 59 yrs	60+ yrs
Reports - Female	54	2,001	2,793	1,443	962	473	19
Reports - Male	4	417	1,337	958	741	480	32
Reports - Other *	0	2	3	1	0	0	0
Rate - Female	46.6	1,499.6	1,798.8	884.5	314.3	67.8	3.6
Rate - Male	3.2	294.3	802.4	571.3	247.6	70.5	6.9

* Other - transgender and gender unknown

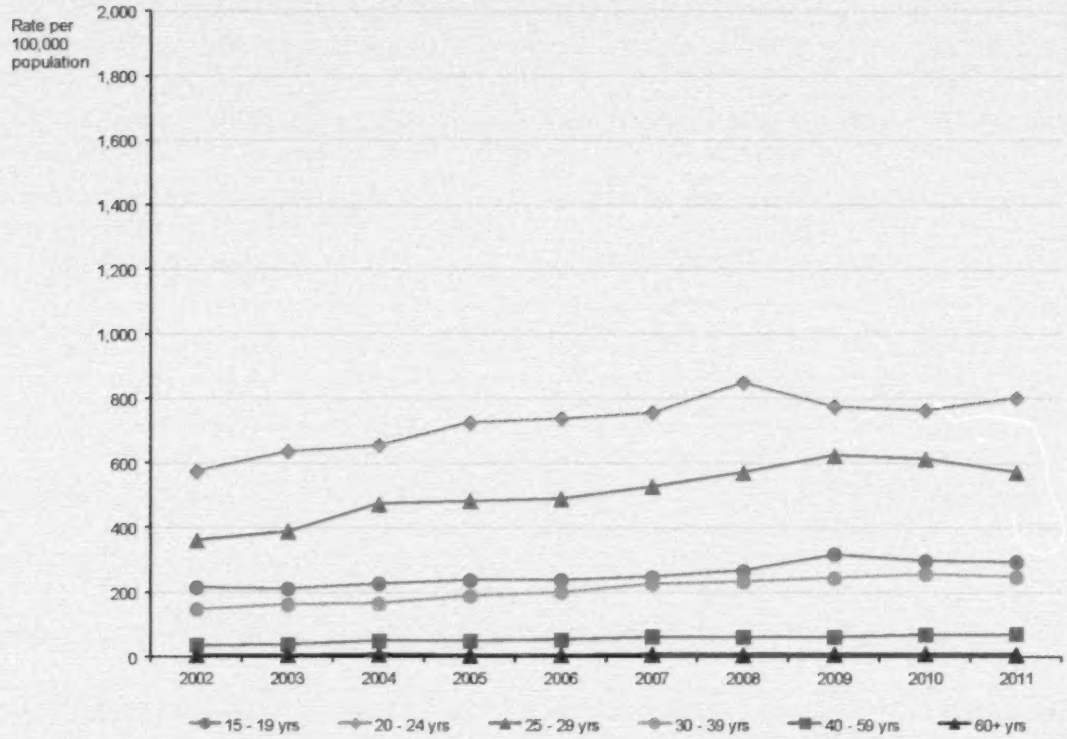
6. Genital chlamdyia case reports in BC by age group - total, 2002 to 2011



7. Genital chlamydia case reports in BC by age group - female, 2002 to 2011



8. Genital chlamydia case reports in BC by age group - male, 2002 to 2011



Extra-genital Chlamydia

A small number of extra-genital chlamydia infections are diagnosed each year in BC, with 26 cases identified in 2011 (10 females and 16 males). From 2002 to 2011, 200 infections were identified in specimens collected from the following sites: throat (27 cases, 13.5%), eye (111 cases, 55.5%), lung (2 cases, 1.0%), and other sites (60 cases, 30.0%) (Figure 9). As screening for chlamydia infections at extra-genital sites is not routine practice, these findings are strongly influenced by provider testing practices.

9. Extra-genital chlamydia case reports in BC by site/culture, 2002 to 2011

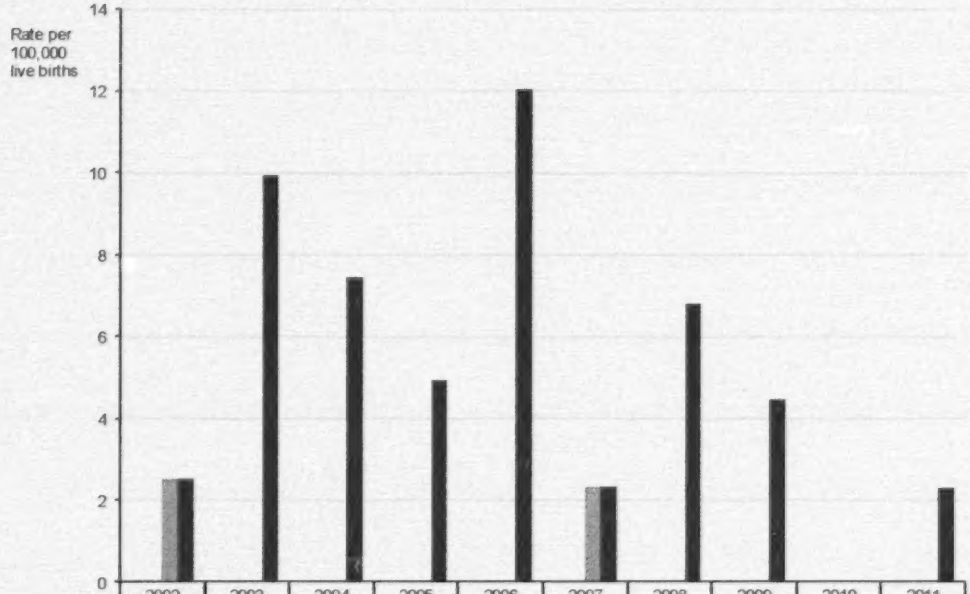
Gender	Site	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Female	Throat	0	0	0	0	1	2	0	0	0	0
	Eye	6	6	5	9	6	3	3	6	3	3
	Lung	0	0	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	1	7	10	10	7
	Total	6	6	5	9	7	6	10	16	13	10
Male	Throat	0	0	0	4	4	1	6	2	6	1
	Eye	8	3	12	5	8	5	5	5	5	5
	Lung	1	0	0	0	0	1	0	0	0	0
	Other	0	0	0	0	0	1	4	0	10	10
	Total	9	3	12	9	12	8	15	7	21	16
BC	Throat	0	0	0	4	5	3	6	2	6	1
	Eye	14	9	17	14	14	8	8	11	8	8
	Lung	1	0	0	0	0	1	0	0	0	0
	Other	0	0	0	0	0	2	11	10	20	17
	Total	15	9	17	18	19	14	25	23	34	26

Total reports for BC is the sum of the following genders: female, male, transgender and gender unknown

Perinatally-acquired Chlamydia

Genital chlamydia can be passed by pregnant women to their infants during delivery, which can lead to opthalmia neonatorum and pneumonia. One case of perinatally-acquired chlamydia infection was found in a conjunctival specimen for 2011. From 2002 to 2011, the majority of cases are from conjunctival specimens (22/24 cases, 91.7%) while only a couple of cases (2/24 cases, 8.3%) are identified in respiratory specimens (Figure 10). Current standards of screening and treatment of chlamydia infection for pregnant women in BC, and of prophylaxis of newborns to prevent complications have most likely resulted in the low rates of perinatally-acquired chlamydia.

10. Perinatally-acquired chlamydia case reports in BC by site, 2002 to 2011



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Reports - Respiratory	1	0	0	0	0	1	0	0	0	0
Reports - Conjunctival	1	4	3	2	5	1	3	2	0	1
Rate - Respiratory	2.5	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0
Rate - Conjunctival	2.5	9.9	7.4	4.9	12.0	2.3	6.8	4.5	0.0	2.3

Lymphogranuloma Venereum

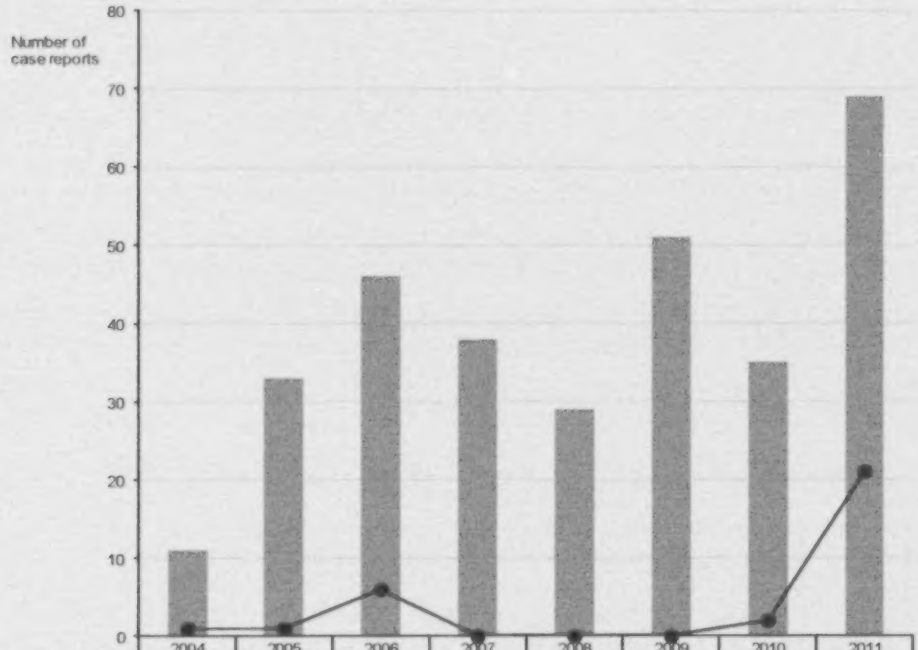
Lymphogranuloma venereum (LGV) is a sexually transmitted infection caused by *C. trachomatis* serotypes L1, L2 and L3. The clinical presentation of LGV includes genital papules, ulcers, inguinal lymphadenopathy, and hemorrhagic proctitis. If left untreated, LGV can cause serious sequelae such as lymphatic obstruction or anogenital ulcerations. LGV can easily be misdiagnosed as other sexually transmitted infections or gastrointestinal disease.

LGV emerged in Canada in 2003, with the first reported case in BC in 2004. With increasing cases among gay, bisexual and other men who have sex with men (MSM) in Europe and the US, provincial LGV surveillance commenced in 2004.

From 2004 to 2011, 31 cases of LGV (24 confirmed, 7 probable) were reported in BC (Figure 11). All 31 cases are among MSM and were either diagnosed in Vancouver or southern Vancouver Island. Of those with known HIV status, 73.1% (19/26 cases) were co-infected with HIV. Most cases (21/23 cases, 91.3%) presented with symptoms of proctitis. In 2011, the male rate of LGV in BC is 0.9 (21 cases) per 100,000 population and the average age is 47 years (range 27-60 years). The majority of cases in 2011 are among people identified as Caucasian (14 cases, 66.7%).[3]

Both male rectal chlamydia and LGV cases increased in 2011. Factors that have led to this increase include the start of routine testing of rectal chlamydia specimens for LGV in 2011 and augmented case-finding. The increase of BC cases in 2011 may also be related to increased transmission as reported in Europe and the US.

11. Lymphogranuloma venereum case reports in BC - male, 2004 to 2011



	2004	2005	2006	2007	2008	2009	2010	2011
Reports - Rectal Chlamydia	11	33	46	38	29	51	35	69
Reports - LGV	1	1	6	0	0	0	2	21

Gonorrhea

Genital Gonorrhea by Region, Gender and Age

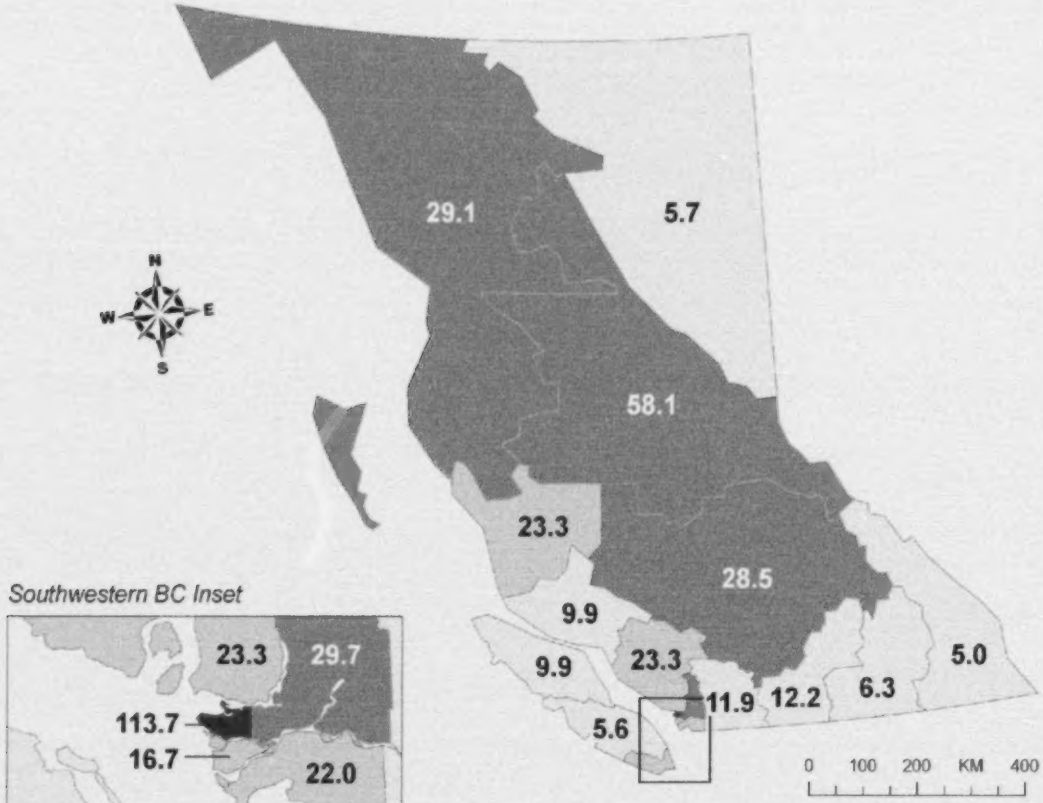
Gonorrhea infections may be asymptomatic or the symptoms may be mild, and as a result, the reports of diagnosed infections may be a portion of the total population burden. As with chlamydia, genital gonorrhea if untreated can lead to pelvic inflammatory disease (and associated complications) in females, and epididymo-orchitis in males. While infected with gonorrhea, an individual is also at increased risk of acquiring HIV.

Overall since 1998, the provincial genital gonorrhea rate in BC has increased consistent with national rates (Figure 13). The genital gonorrhea rate in BC increased to 34.3 (1,573 cases) in 2011 from 29.2 (1,321 cases) per 100,000 population in 2010. The highest rates are in Vancouver Coastal and Northern Health Authorities (Figure 14). Rates among Health Service Delivery Areas vary with the highest rates in Vancouver, Northern Interior and Fraser North, and the lowest rates in East Kootenay, Central Vancouver Island and Northeast (Figure 12). The increase in gonorrhea rates over time is likely related to multiple factors, including changes in laboratory testing and screening practices over time (e.g., the routine inclusion of gonorrhea with chlamydia urine nucleic acid testing, and increased acceptability of urine-based testing among men over time). It is also possible that changes in behaviour may be contributing to a true increase in incidence during this time period.

Males continue to have a rate two times greater than females (Figure 15). Although the rate among males was relatively stable between 2004 and 2010, it increased in 2011. Since 2008, female gonorrhea rates have shown a gradual decline despite a slight increase in 2011. Similar to trends from 2003 to 2010, in 2011, the highest rates of gonorrhea were among those aged 20-29 years (Figure 17). The highest rates were among males in the 20-29 year age groups, and the increase in cases in 2011 was observed in all age groups (Figure 19). For females, the highest rates were among those aged 15-24 years (Figure 18).

Gonorrhea is more likely to be concentrated in sexually active networks, and it is likely that in part the reason for higher rates of gonorrhea in males is due to higher rates of gonorrhea among gay, bisexual and other men who have sex with men (MSM). While provincial surveillance data does not permit identification of MSM cases, this has been observed in other jurisdictions.

12. Genital gonorrhea case reports in BC by health service delivery area, 2011



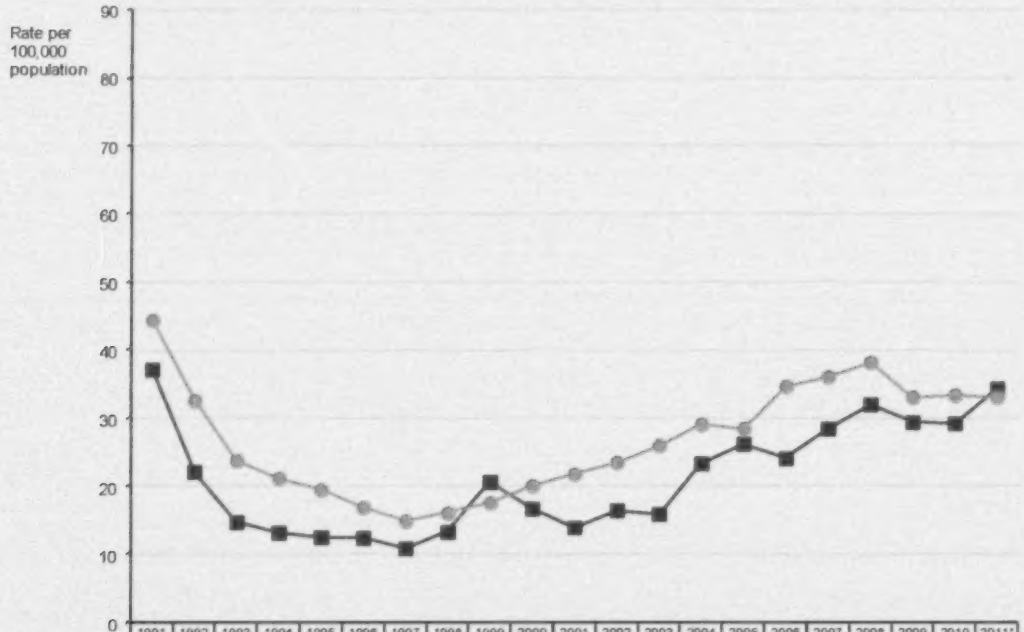
Rate per 100,000 population by HSDA

- 5.0 - 12.2
- 12.3 - 23.3
- 23.4 - 58.1
- 58.2 - 113.7

ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	4	5.0
12	Kootenay Boundary	5	6.3
13	Okanagan	43	12.2
14	Thompson Cariboo Shuswap	64	28.5
21	Fraser East	34	11.9
22	Fraser North	183	29.7
23	Fraser South	160	22.0
31	Richmond	33	16.7
32	Vancouver	760	113.7
33	North Shore/Coast Garibaldi	67	23.3
41	South Vancouver Island	73	19.5
42	Central Vancouver Island	15	5.6
43	North Vancouver Island	12	9.9
51	Northwest	22	29.1
52	Northern Interior	84	58.1
53	Northeast	4	5.7

Rates calculated with population estimates released by BC Stats

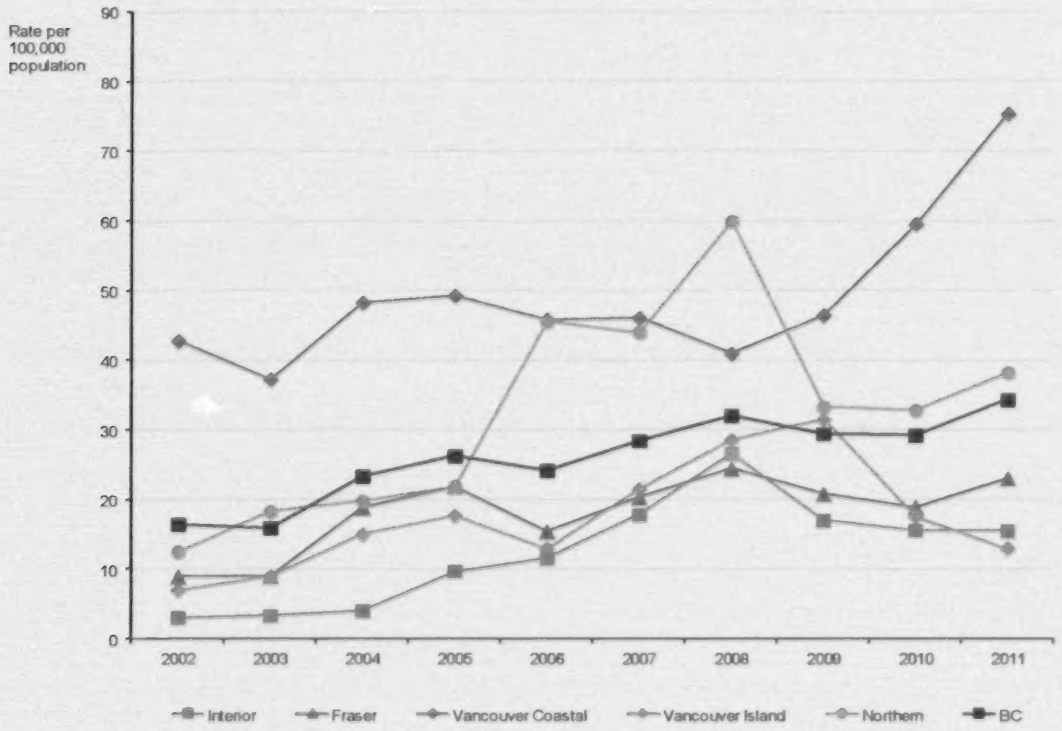
13. Genital gonorrhea case reports in BC and Canada by historical trend, 1991 to 2011



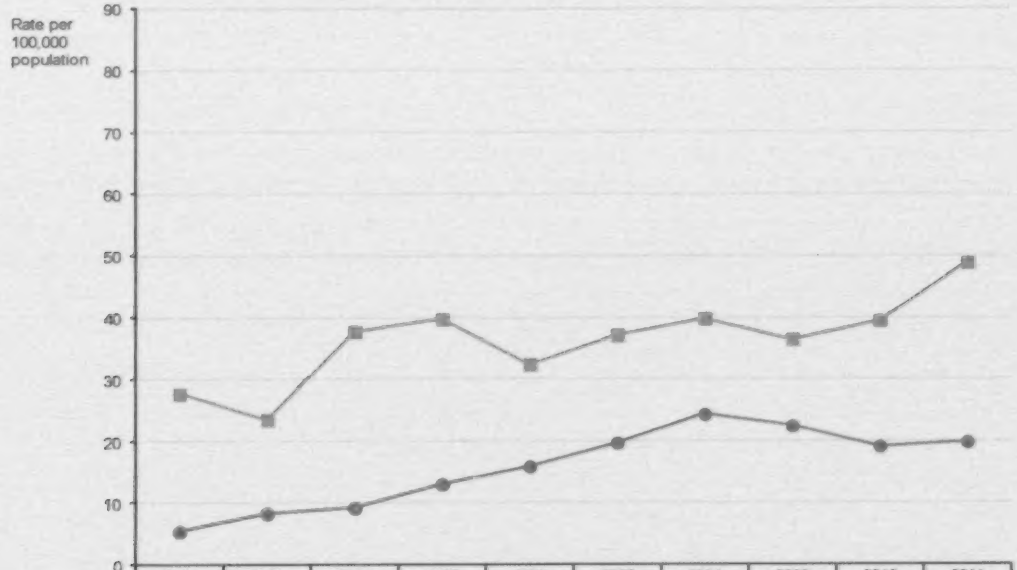
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011*
BC Reports	1,250	766	526	484	474	480	429	529	826	673	568	673	654	969	1,100	1,022	1,224	1,405	1,309	1,321	1,573
BC Rate	37.1	22.1	14.7	13.2	12.5	12.4	10.9	13.3	20.6	16.7	13.9	16.4	15.9	23.3	26.2	24.1	28.4	32.0	29.4	29.2	34.3
Canadian Rate	44.4	32.6	23.8	21.2	19.5	16.9	14.9	16.1	17.8	20.1	21.8	23.5	26.0	29.1	28.5	34.7	36.1	38.2	33.1	33.4	33.1

*2011 Canadian rate is preliminary and subject to change

14. Genital gonorrhea case reports in BC by health authority, 2002 to 2011



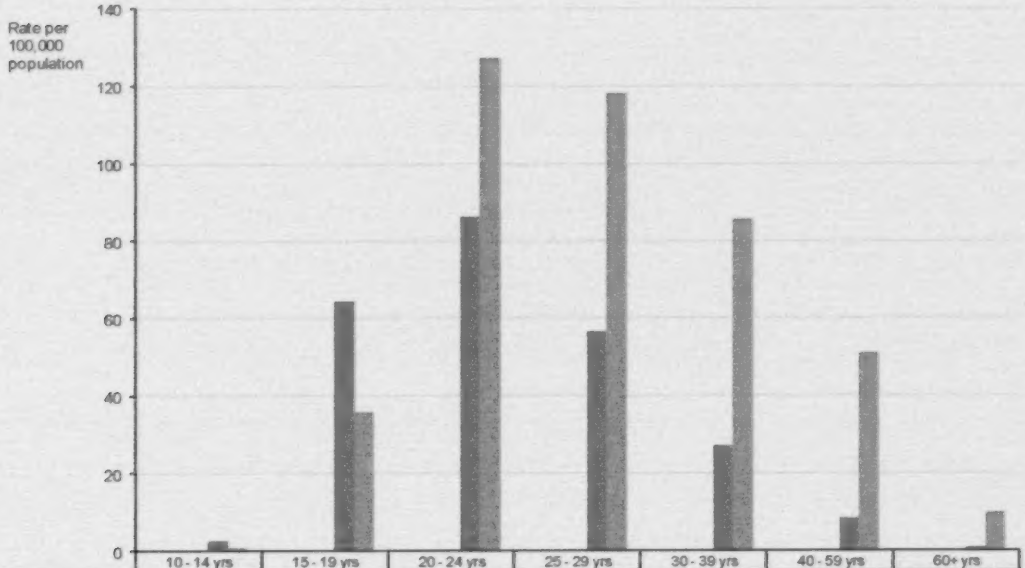
15. Genital gonorrhea case reports in BC by gender, 2002 to 2011



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Reports - Female	111	172	192	275	340	429	537	503	435	458
Reports - Male	562	481	776	825	681	793	866	805	884	1,112
Reports - Other *	0	1	1	0	1	2	2	1	2	3
Rate - Female	5.4	8.3	9.2	13.0	15.9	19.7	24.3	22.4	19.1	19.8
Rate - Male	27.7	23.5	37.7	39.7	32.4	37.1	39.8	36.4	39.4	48.8

* Other - transgender and gender unknown

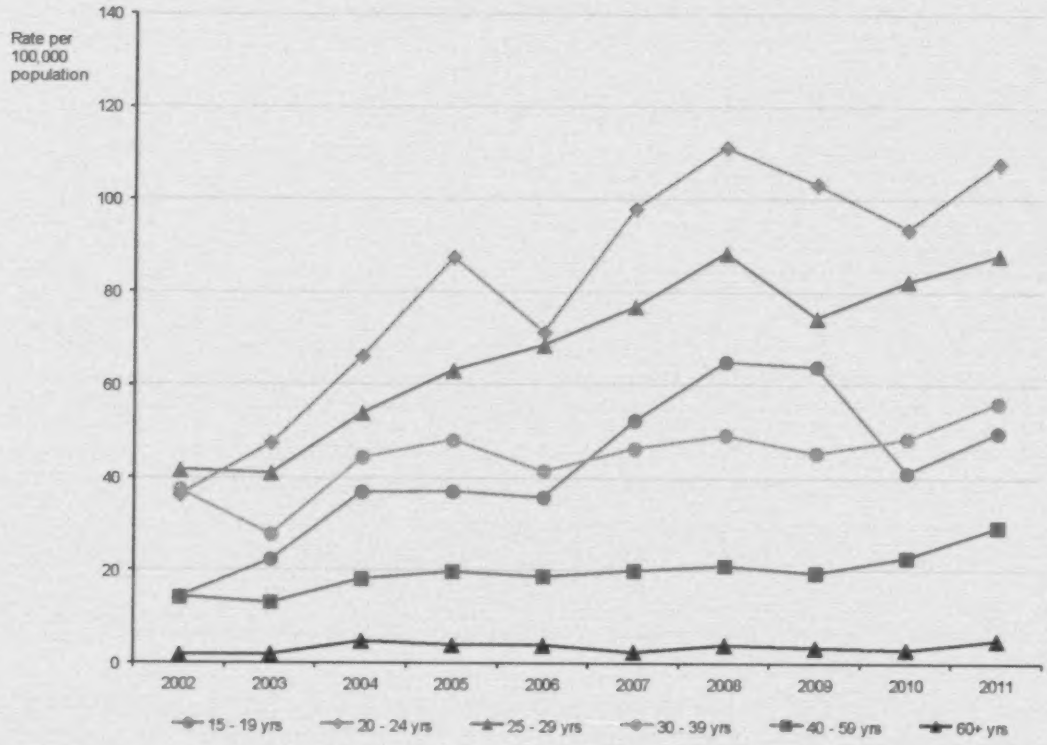
16. Genital gonorrhea case reports in BC by age group and gender, 2011



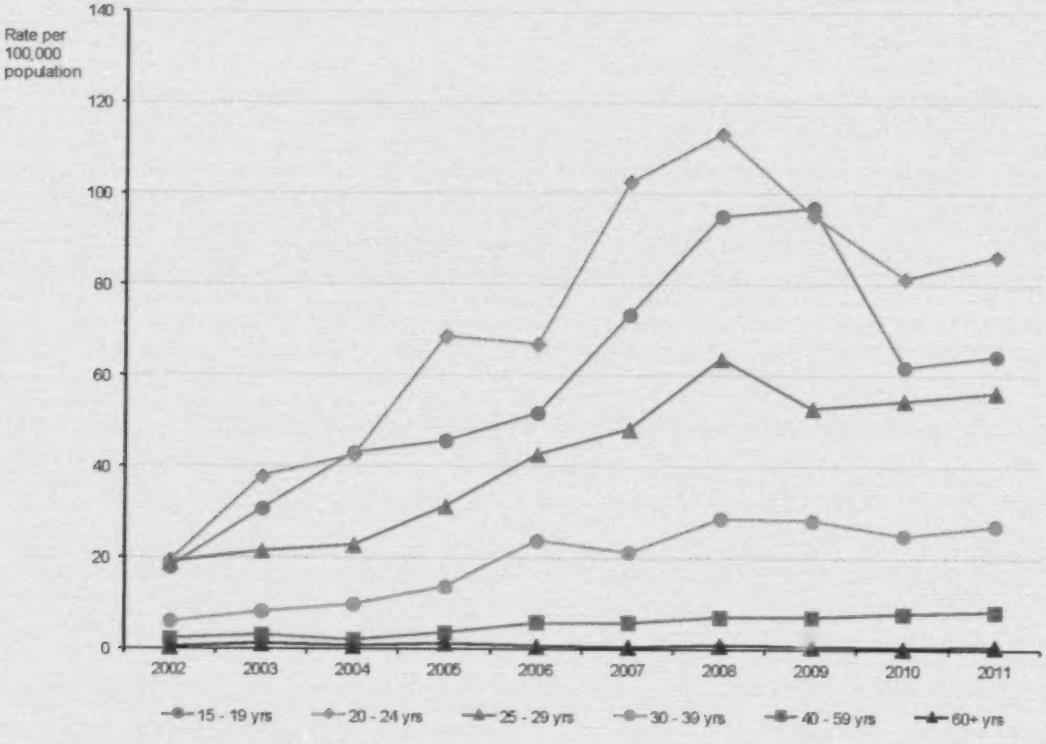
	10 - 14 yrs	15 - 19 yrs	20 - 24 yrs	25 - 29 yrs	30 - 39 yrs	40 - 59 yrs	60+ yrs
Reports - Female	3	86	134	92	83	57	3
Reports - Male	1	51	212	198	256	348	46
Reports - Other *	0	0	1	1	1	0	0
Rate - Female	2.6	64.4	86.3	56.4	27.1	8.2	0.6
Rate - Male	0.8	36.0	127.2	118.1	85.5	51.1	9.9

* Other - transgender and gender unknown

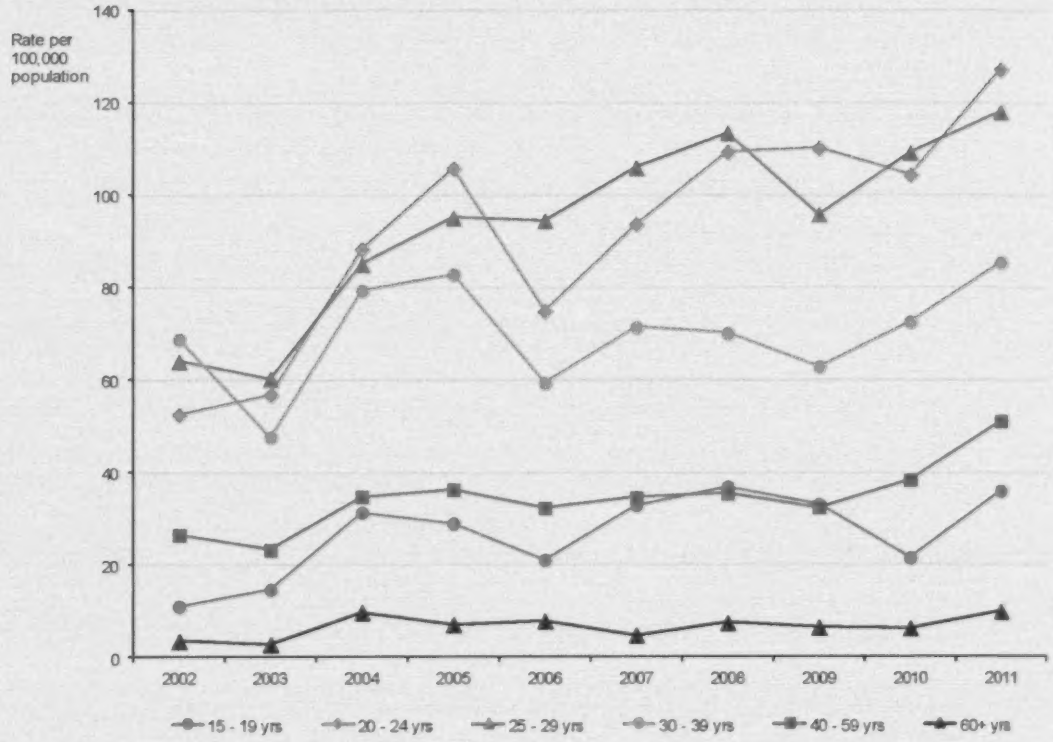
17. Genital gonorrhea case reports in BC by age group - total, 2002 to 2011



18. Genital gonorrhea case reports in BC by age group - female, 2002 to 2011



19. Genital gonorrhea case reports in BC by age group - male, 2002 to 2011



Extra-genital Gonorrhea

Within BC, a small number of extra-genital gonorrhea infections are diagnosed each year. In 2011, 115 cases were identified (13 females, 102 males), which was an increase from 78 cases in 2010. Of the 692 cases diagnosed from 2002 to 2011, cases were identified in the throat (605, 87.4%), eye (16, 2.3%), and other sites (63, 9.1%). A small number of the diagnosed cases represented disseminated gonococcal infection (8, 1.2%) (Figure 20). As screening for gonorrhea at extra-genital sites is not routine practice, these findings are strongly influenced by provider testing practices, and this may explain the increase in throat infections diagnosed in 2011.

20. Extra-genital gonorrhea case reports in BC by site/culture, 2002 to 2011

Gender	Site	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Female	Throat	6	6	1	14	16	15	3	7	8	12
	Eye	0	0	1	0	0	1	1	0	1	0
	Other	1	2	3	3	3	5	1	0	2	1
	DGI *	1	0	1	2	0	0	1	0	0	0
	Total	8	8	6	19	19	21	6	7	11	13
Male	Throat	41	27	54	74	41	46	41	43	55	93
	Eye	2	1	0	1	0	1	1	4	2	0
	Other	0	1	1	10	4	0	2	5	10	9
	DGI *	0	1	0	0	0	0	1	1	0	0
	Total	43	30	55	85	45	47	45	53	67	102
BC	Throat	47	33	55	88	57	61	44	52	63	105
	Eye	2	1	1	1	0	2	2	4	3	0
	Other	1	3	4	13	7	5	3	5	12	10
	DGI *	1	1	1	2	0	0	2	1	0	0
	Total	51	38	61	104	64	68	51	62	78	115

* DGI - disseminated gnococcal infection

Total reports for BC is the sum of the following genders: female, male, transgender and gender unknown

Perinatally-acquired Gonorrhea

In 2011, there were no reports of perinatally-acquired gonorrhea, with only a single case identified between 2002 and 2010.

Gonorrhea Antimicrobial Resistance

Treatment of gonorrhea has long been challenged by the bacterium's ability to acquire resistance to multiple classes of antibiotics. Historically effective drugs – penicillin, doxycycline and ciprofloxacin – have been successively removed from treatment guidelines, leaving few remaining options. Canadian treatment guidelines thus currently recommend third-generation cephalosporins for the treatment of gonorrhea: injectable ceftriaxone (250mg) or oral cefixime (800mg), co-treated with 1g of azithromycin.[4] Recent international surveillance data, however, suggest that susceptibility of gonorrhea to these current first-line treatments is also now threatened. In this context, local surveillance is critical.

The BC Public Health Microbiology Reference Laboratory (BCPHMRL) located at BCCDC routinely tests *N. gonorrhoeae* isolates for susceptibility to a panel of antimicrobial drugs, including cefixime, ceftriaxone and azithromycin. Data presented here illustrate the minimum inhibitory concentration (MIC) of these drugs among isolates from BC. The MIC represents the lowest amount of drug required to inhibit growth of the bacterium; a higher MIC thus suggests that the bacterium is less susceptible to the drug.

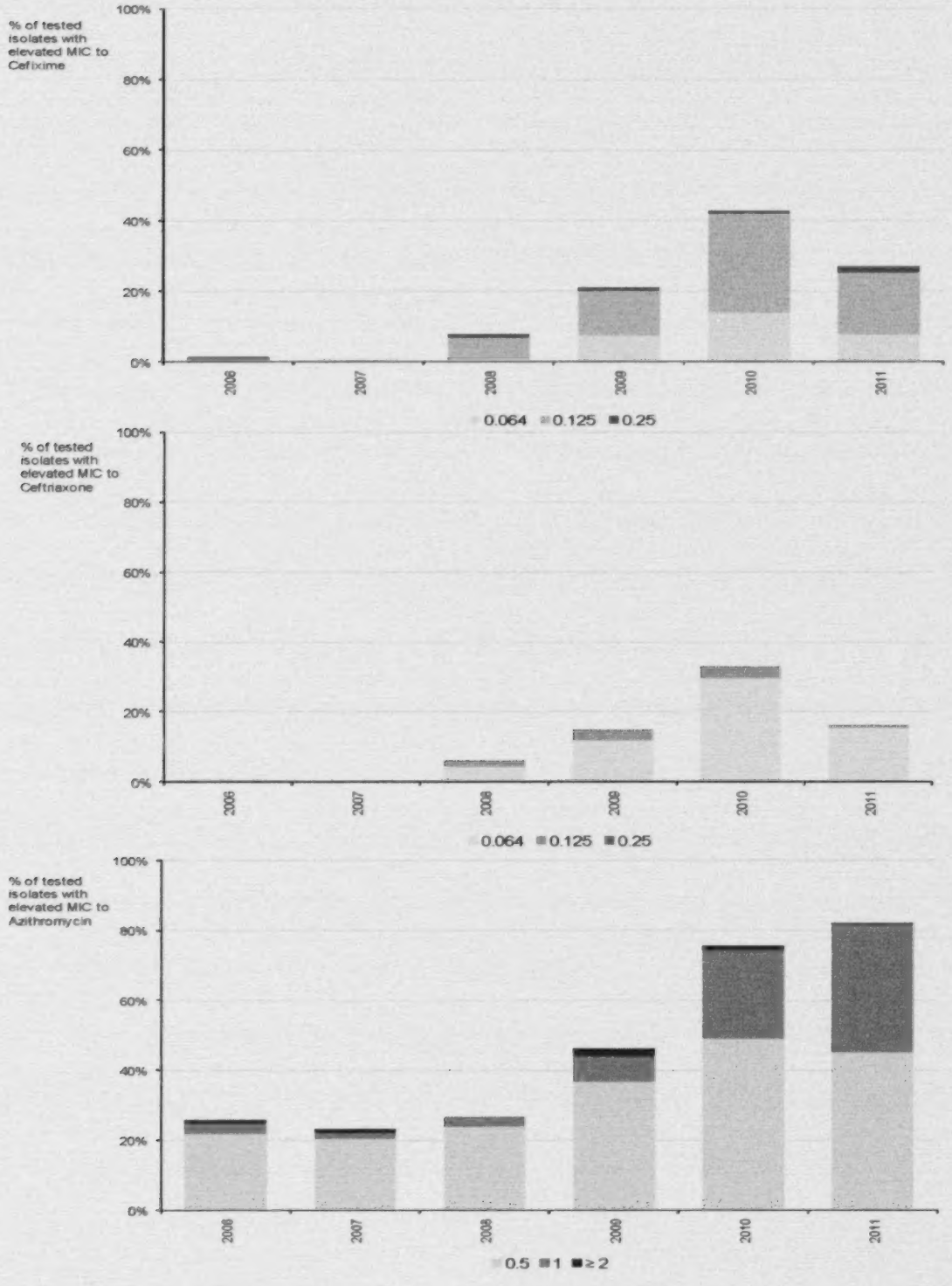
A total of 1,837 isolates were tested between 2006 and 2011, representing 22.0% (1837/8353) of all gonorrhea cases reported in the province. While no isolate was fully resistant to cefixime or ceftriaxone[5] and no treatment failures were reported in BC during this period, 0.9% (16/1807) of isolates showed MIC just below the non-susceptible threshold for cefixime. Furthermore, the percentage of isolates with cefixime or ceftriaxone MIC within three dilutions of the non-susceptible threshold (also termed "elevated MIC") increased over the past six years. Likewise, the percentage of isolates non-susceptible to azithromycin[6] or within two dilutions of this threshold increased over time.

Fifty-one percent (933/1837) of isolates tested for drug susceptibility were sampled from the urethra, 22.6% (415/1837) from the rectum (99% of which were from male clients), 13.1% (240/1837) from the cervix, and 11.9% (219/1837) from the throat (91% from males). Susceptibility to all drugs showed a consistent pattern by site of infection whereby rates of elevated MIC (reduced susceptibility) were highest at the rectal site, next highest at the throat, lower in urethral specimens, and lowest in cervical specimens.

The trend toward rising MIC – or decreased susceptibility – for first-line gonococcal treatments in BC is mirrored in data from other parts of the world and suggests that full resistance to these drugs may eventually develop. Canadian treatment guidelines are expected to continue to evolve in response to these trends. The threat of cefixime and ceftriaxone resistance has focused attention on STI prevention and control measures such as increased testing, partner notification for gonorrhea cases, and tests of cure.

21. Percentage of tested *N. gonorrhoeae* isolates with elevated minimum inhibitory concentrations (MIC) to Cefixime, Ceftriaxone, and Azithromycin in BC, 2006 to 2011

Elevated MIC defined here as ≥0.064 µg/mL for cefixime/ceftriaxone (no isolates were considered non-susceptible according to the Clinical and Laboratory Standards Institute (CLSI) threshold of ≥0.5 µg/mL) and ≥0.5 µg/mL for azithromycin (1% of isolates were considered non-susceptible according to threshold of ≥2 µg/mL).



Pelvic Inflammatory Disease and Ectopic Pregnancy

Sexually transmitted infections such as chlamydia and gonorrhea can potentially cause pelvic inflammatory disease (PID) and ectopic pregnancy (EP) in women. Examination of these rates can provide an indicator of the trends in complications that may be due to these STIs. Data are presented up to 2010 because of lags in reporting, collation and transfer of data. Included in this report are data of physician billings (representing inpatient and outpatient treatment) and hospital discharges (representing inpatient treatment) provided by the BC Ministry of Health.

In BC, steady declines in physician billings and hospital discharges related to PID have been observed over time. Rates in hospital discharges for EP have shown a similar trend, although physician billings for EP have increased slightly in recent years. These trends – as potential complications of genital chlamydia and gonorrhea – are correlated with and the opposite of trends in these infections among women which have been decreasing over these time periods.[7] This is attributed to the success in public health programs in diagnosis and treatment of these infections over past decades, preventing these complications from developing.

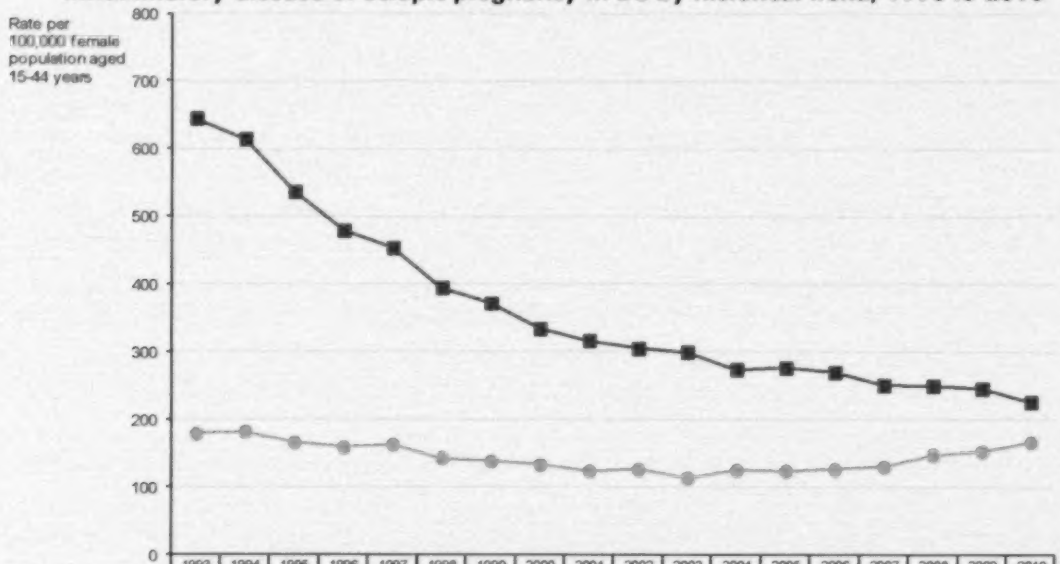
Pelvic Inflammatory Disease

In 2010, the rate of physician billings related to PID decreased to 225.5 (2,061 physician billings) from 245.7 (2,225 physician billings) per 100,000 women aged 15-44 years in 2009 (Figure 22). Rate of hospital discharges related to PID show a slight increase to 31.8 (291 hospital discharges) in 2010 from 30.1 (273 hospital discharges) per 100,000 women aged 15-44 years in 2009 (Figure 23).

Ectopic Pregnancy

The rate of physician billings related to EP increased to 166.5 (1,522 physician billings) in 2010 from 152.7 (1,383 physician billings) per 100,000 women aged 15-44 years in 2009 (Figure 22). In contrast, the rate of hospital discharges related to EP have decreased to 53.5 (489 hospital discharges) in 2010 from 55.3 (501 hospital discharges) per 100,000 women aged 15-44 years in 2009 (Figure 23).

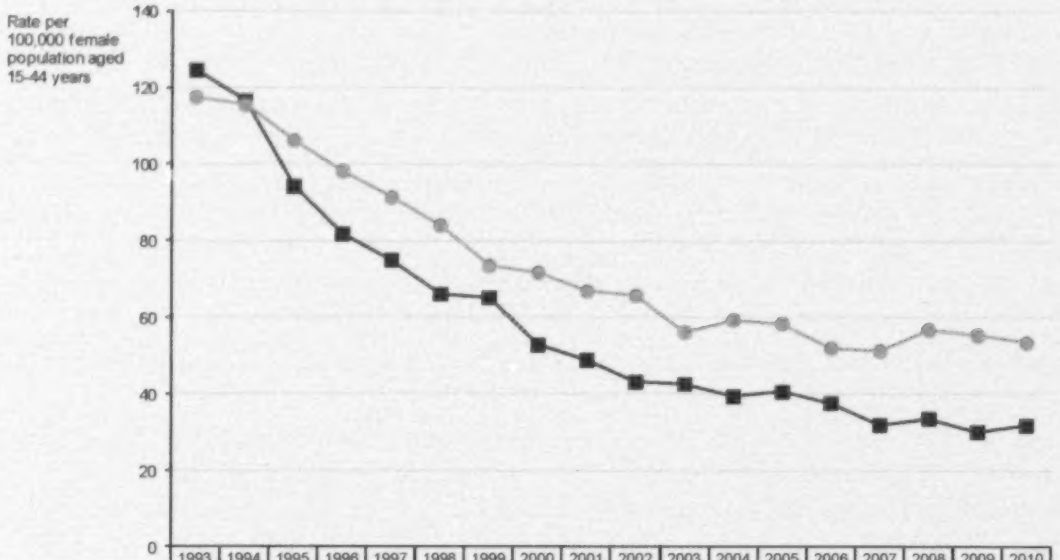
22. Case reports of women aged 15-44 years with a physician billing related to pelvic inflammatory disease or ectopic pregnancy in BC by historical trend, 1993 to 2010



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Reports - PID	5,326	5,196	4,636	4,261	4,089	3,559	3,351	3,002	2,846	2,724	2,652	2,417	2,435	2,377	2,230	2,242	2,225	2,061
Reports - EP	1,478	1,541	1,436	1,410	1,469	1,289	1,248	1,196	1,116	1,127	1,006	1,103	1,093	1,114	1,156	1,323	1,383	1,522
Rate - PID	644.3	613.7	535.9	478.9	453.2	394.4	371.6	333.7	316.2	304.7	299.2	273.7	276.0	269.3	250.7	249.6	245.7	225.5
Rate - EP	178.8	182.0	166.0	158.5	162.8	142.9	138.4	132.9	124.0	126.1	113.5	124.9	123.9	126.2	129.9	147.3	152.7	166.5

PID - pelvic inflammatory disease
EP - ectopic pregnancy

23. Case reports of women aged 15-44 years with a hospital discharge related to pelvic inflammatory disease or ectopic pregnancy in BC by historical trend, 1993 to 2010



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Reports - PID	1,030	987	815	728	677	596	588	475	440	385	378	347	358	333	284	302	273	291
Reports - EP	971	978	920	874	825	759	664	646	603	588	498	524	515	460	456	510	501	489
Rate - PID	124.6	116.6	94.2	81.8	75.0	66.1	65.2	52.8	48.9	43.1	42.6	39.3	40.6	37.7	31.9	33.6	30.1	31.8
Rate - EP	117.5	115.5	106.3	98.2	91.4	84.1	73.6	71.8	67.0	65.8	56.2	59.3	58.4	52.1	51.3	56.8	55.3	53.5

PID - pelvic inflammatory disease
EP - ectopic pregnancy

Infectious Syphilis

Infectious Syphilis by Region, Gender and Age

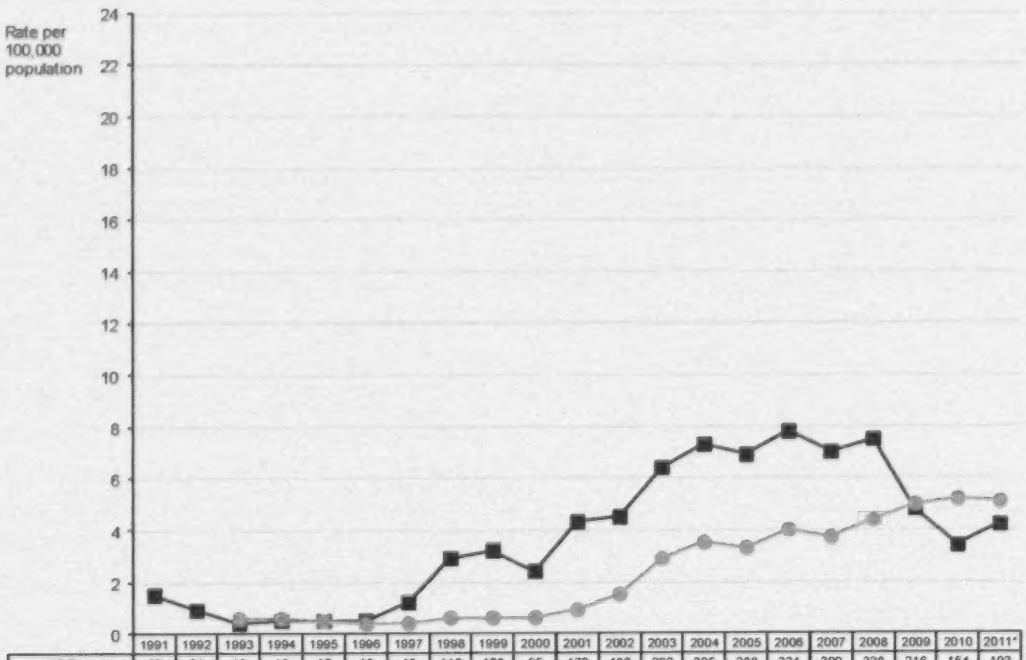
The initial symptoms of syphilis may not always be recognized and without treatment, individuals generally enter a prolonged asymptomatic phase which can lead to serious complications including cardiovascular and neurologic disease, and may be fatal. Infectious syphilis rates therefore reflect an underestimate of the total population burden.

Following a decline in rates in BC, by the early 1990's infectious syphilis began to re-emerge in BC starting in 1997, corresponding to a series of outbreaks in different populations. In BC, the rate of infectious syphilis (i.e., primary, secondary and early latent) increased in 2011 to 4.2 (193 cases) from 3.4 (154 cases) per 100,000 population in 2010 (Figure 24). The highest rates of infectious syphilis are in Vancouver Coastal Health Authority (Figure 26) and across Health Service Delivery Areas, the highest rates are in Vancouver and South Vancouver Island (Figure 25). From 2002 to 2011, Vancouver Coastal rates were higher than the other Health Authorities and the provincial rates.

Although male infectious syphilis rates decreased in 2009 and 2010, male cases have risen in 2011. In contrast, female rates of infectious syphilis started declining in 2006 and have stabilized in 2011 (Figure 27). The highest rates are among males in the 25-59 year age groups in 2011 (Figure 28); in these age groups the number of infectious syphilis cases increased in 2011 following a decline since 2009 (Figure 31).

At the time of writing this report (January 2013), infectious syphilis cases in males have continued to increase in 2012.

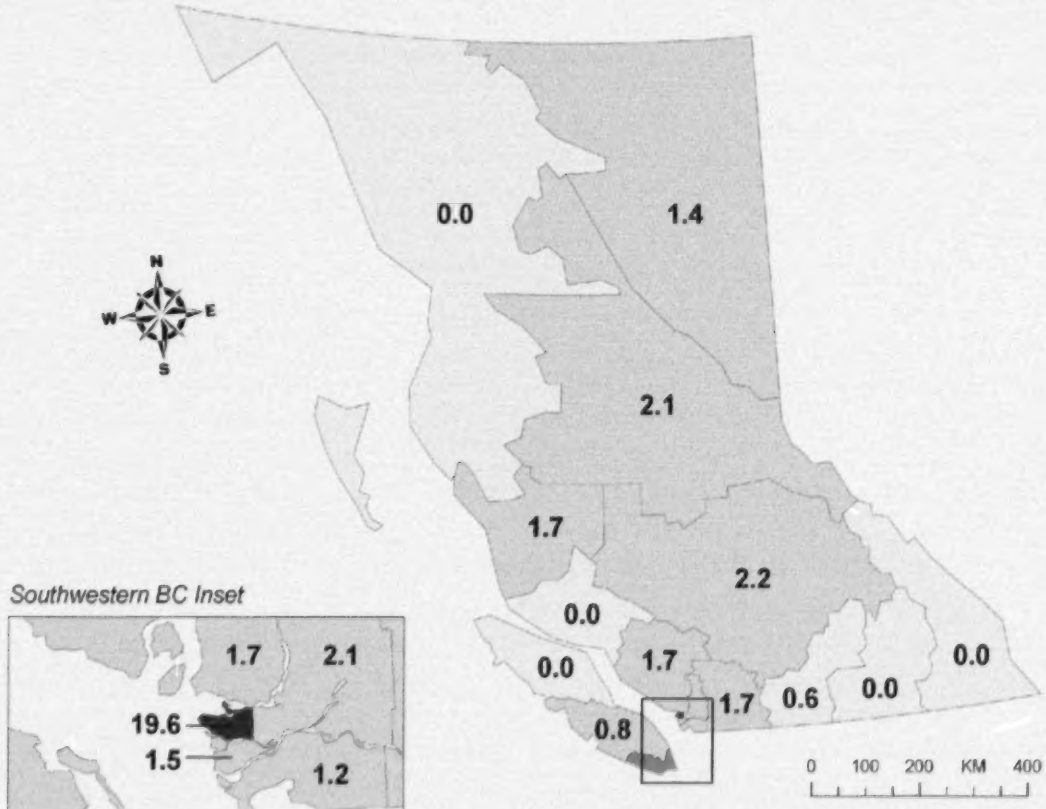
24. Infectious syphilis case reports in BC and Canada by historical trend, 1991 to 2011



	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011*
BC Reports	50	31	16	18	17	19	48	116	128	95	176	186	262	305	288	331	300	328	216	154	193
BC Rate	1.5	0.9	0.4	0.5	0.5	0.5	1.2	2.9	3.2	2.4	4.3	4.5	6.4	7.3	6.9	7.8	7.0	7.5	4.8	3.4	4.2
Canadian Rate			0.6	0.6	0.5	0.4	0.4	0.6	0.6	0.6	0.9	1.5	2.9	3.5	3.3	4.0	3.7	4.4	5.0	5.2	5.1

*2011 Canadian rate is preliminary and subject to change

25. Infectious syphilis case reports in BC by health service delivery area, 2011



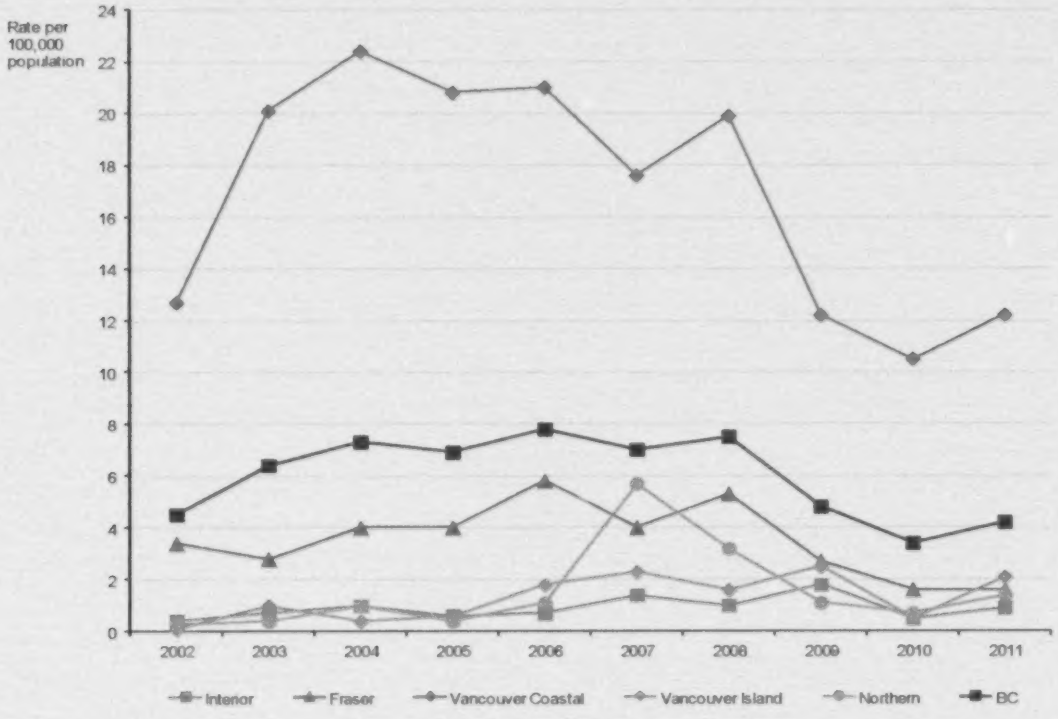
ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	0	0.0
12	Kootenay Boundary	0	0.0
13	Okanagan	2	0.6
14	Thompson Cariboo Shuswap	5	2.2
21	Fraser East	5	1.7
22	Fraser North	13	2.1
23	Fraser South	9	1.2
31	Richmond	3	1.5
32	Vancouver	131	19.6
33	North Shore/Coast Garibaldi	5	1.7
41	South Vancouver Island	14	3.7
42	Central Vancouver Island	2	0.8
43	North Vancouver Island	0	0.0
51	Northwest	0	0.0
52	Northern Interior	3	2.1
53	Northeast	1	1.4

Rate per 100,000 population by HSDA

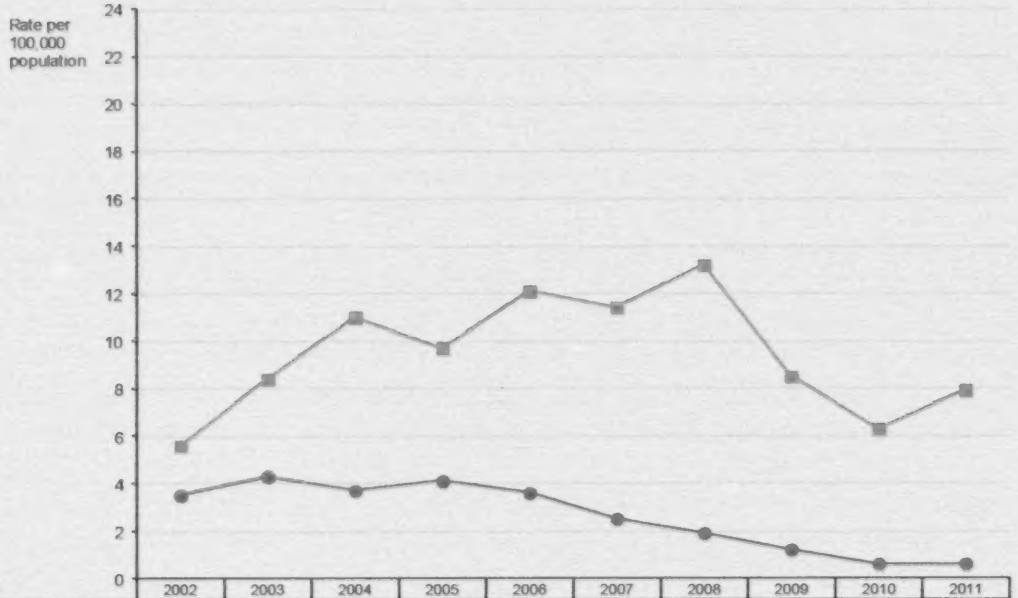
- 0.0 - 0.6
- 0.7 - 2.2
- 2.3 - 3.7
- 3.8 - 19.6

Rates calculated with population estimates released by BC Stats

26. Infectious syphilis case reports in BC by health authority, 2002 to 2011



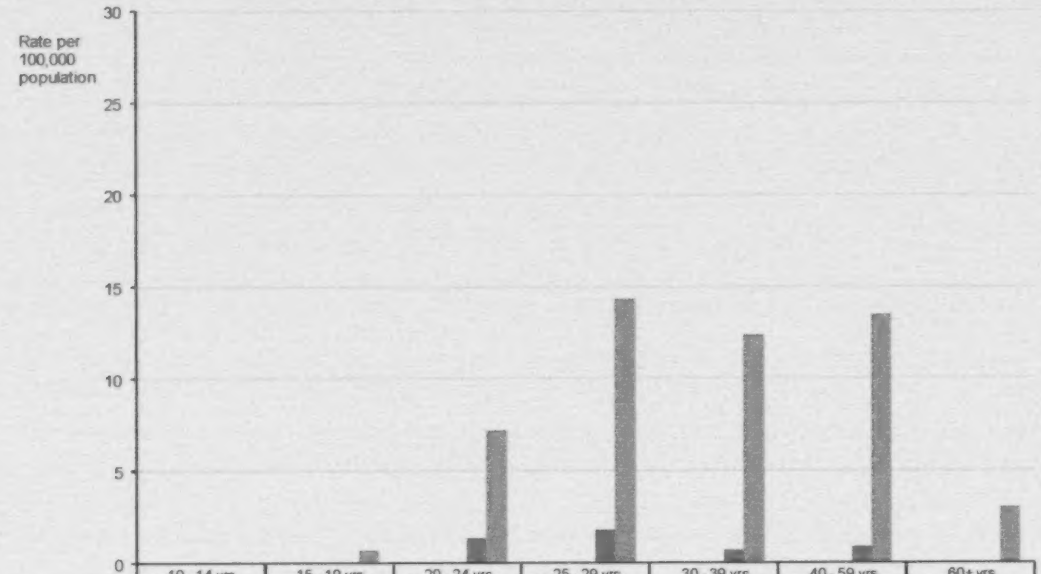
27. Infectious syphilis case reports in BC by gender, 2002 to 2011



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Reports - Female	72	89	78	86	77	55	41	28	13	13
Reports - Male	113	171	226	202	254	244	286	188	141	180
Reports - Other *	1	2	1	0	0	1	1	0	0	0
Rate - Female	3.5	4.3	3.7	4.1	3.6	2.5	1.9	1.2	0.6	0.6
Rate - Male	5.6	8.4	11.0	9.7	12.1	11.4	13.2	8.5	6.3	7.9

* Other - transgender and gender unknown

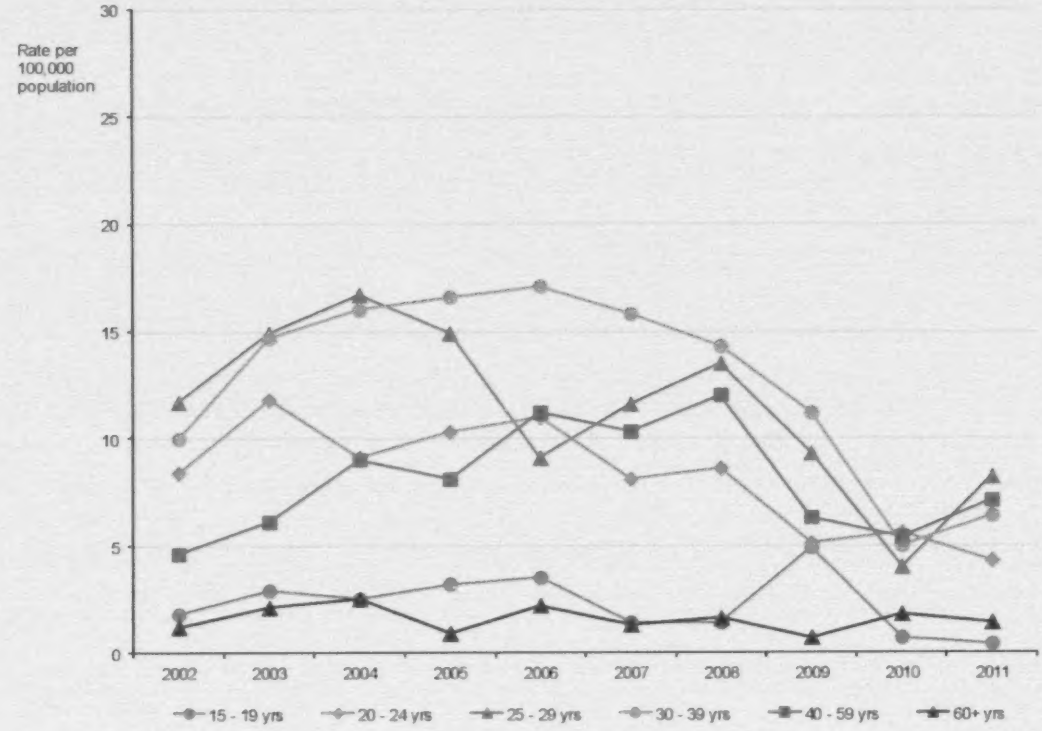
28. Infectious syphilis case reports in BC by age group and gender, 2011



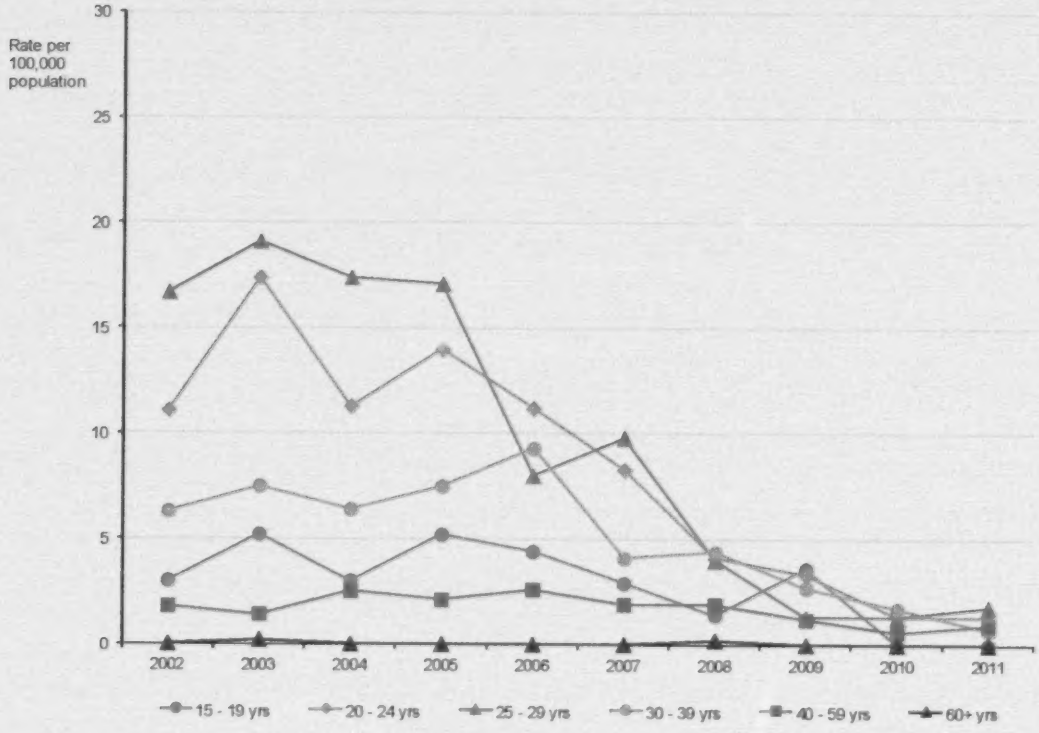
	10 - 14 yrs	15 - 19 yrs	20 - 24 yrs	25 - 29 yrs	30 - 39 yrs	40 - 59 yrs	60+ yrs
Reports - Female	0	0	2	3	2	6	0
Reports - Male	0	1	12	24	37	92	14
Reports - Other *	0	0	0	0	0	0	0
Rate - Female	0.0	0.0	1.3	1.8	0.7	0.9	0.0
Rate - Male	0.0	0.7	7.2	14.3	12.4	13.5	3.0

* Other - transgender and gender unknown

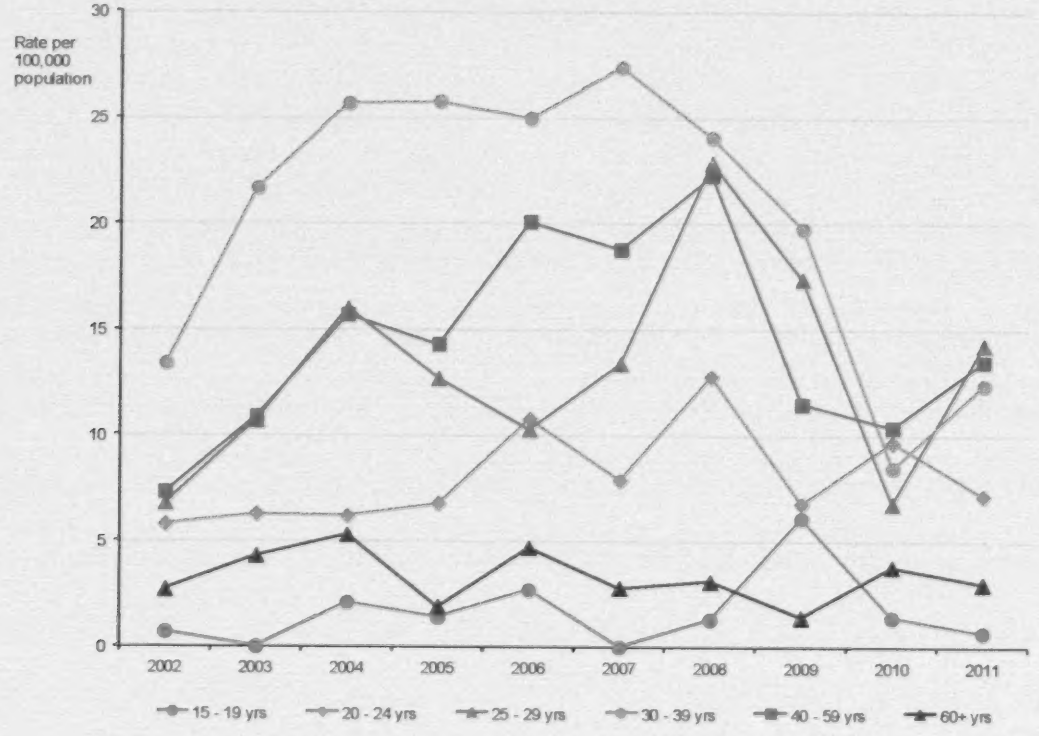
29. Infectious syphilis case reports in BC by age group - total, 2002 to 2011



30. Infectious syphilis case reports in BC by age group - female, 2002 to 2011



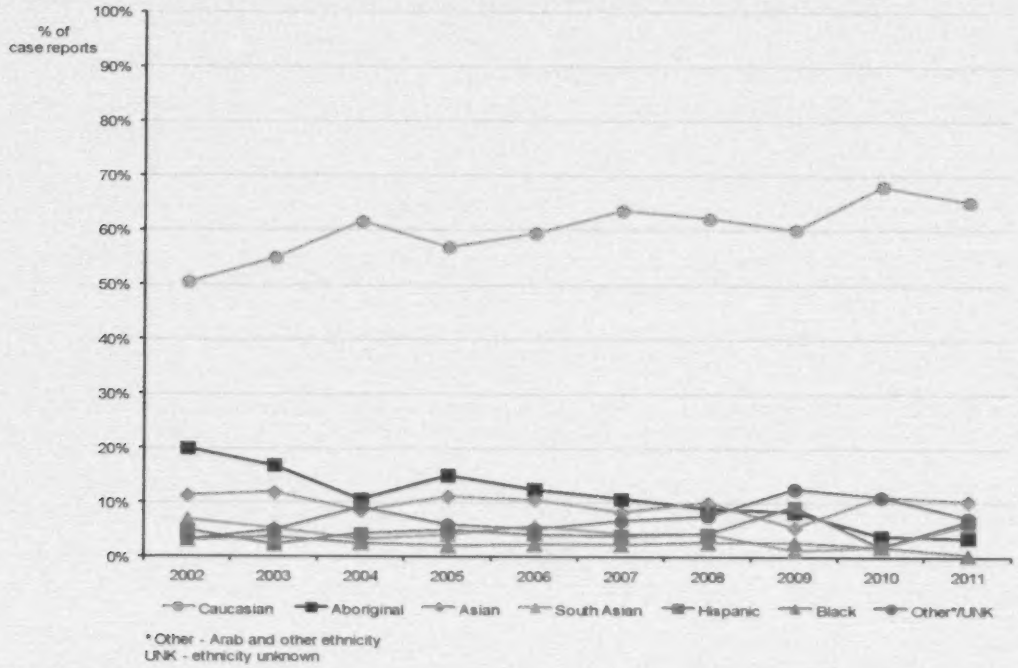
31. Infectious syphilis case reports in BC by age group - male, 2002 to 2011



Infectious Syphilis by Ethnicity

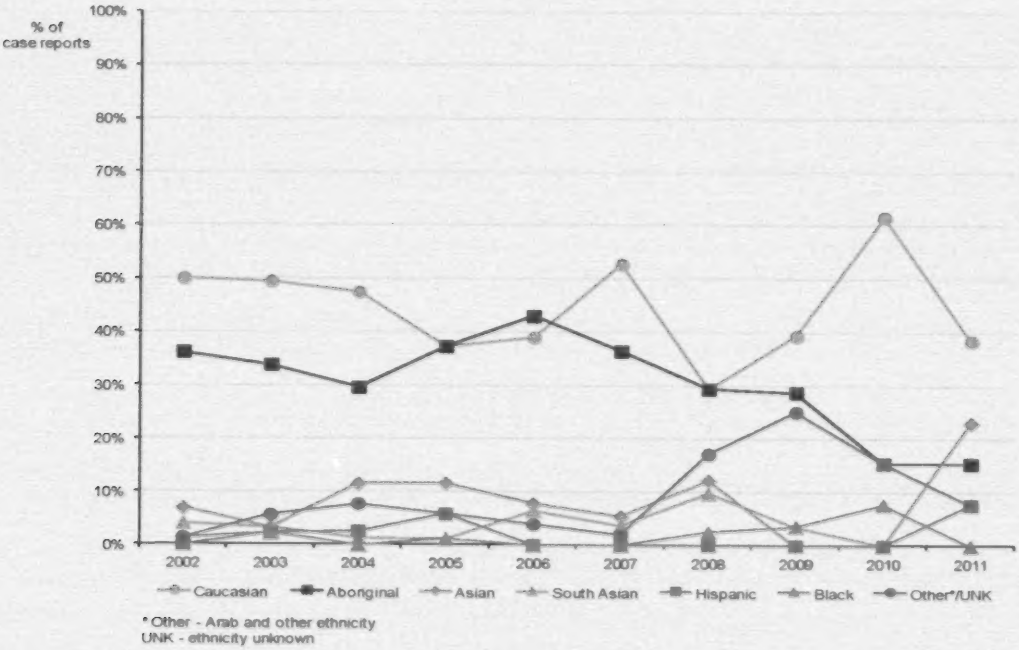
The majority of cases in 2011 are among people identified as Caucasian (126 cases; 65.3%) (Figure 32). In comparison to males, the proportion of infectious syphilis cases of Caucasian ethnicity is generally lower however the trends are highly variable due to the small number of female cases each year (i.e., 13 cases in 2011) (Figure 33).

32. Infectious syphilis case reports in BC by ethnicity - total, 2002 to 2011



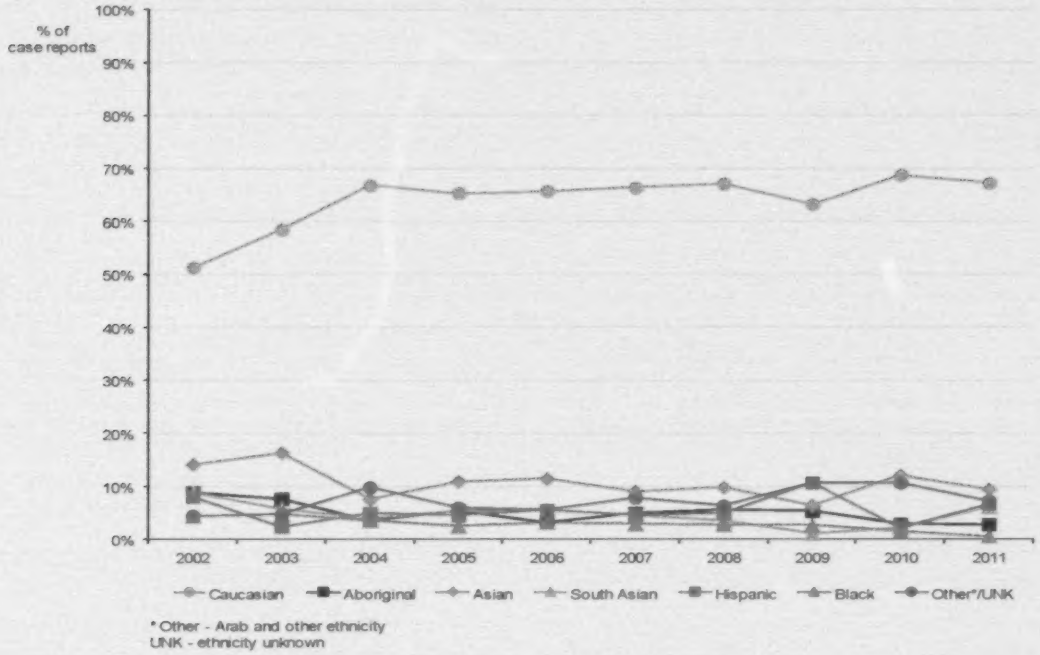
* Other - Arab and other ethnicity
UNK - ethnicity unknown

33. Infectious syphilis case reports in BC by ethnicity - female, 2002 to 2011



* Other - Arab and other ethnicity
UNK - ethnicity unknown

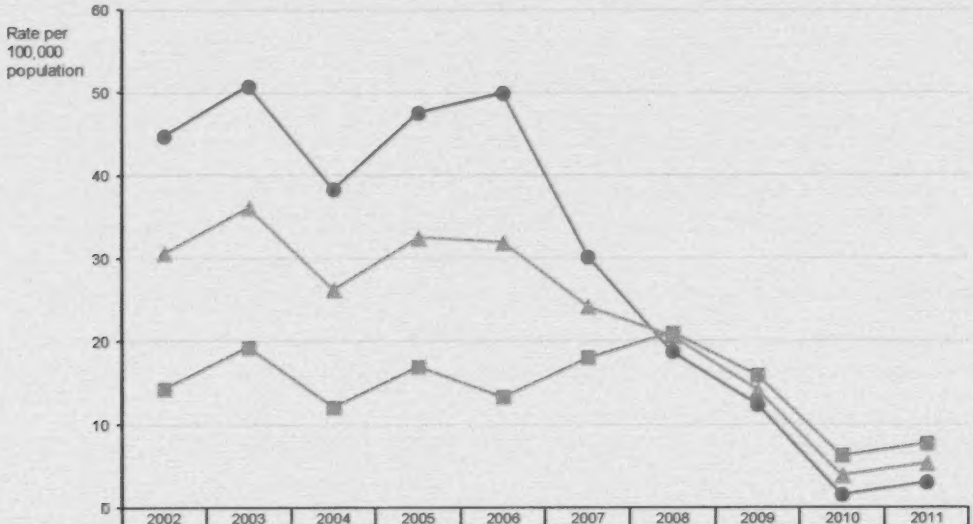
34. Infectious syphilis case reports in BC by ethnicity - male, 2002 to 2011



Infectious Syphilis among First Nations People

Between 2002 and 2011, the rate of infectious syphilis among Aboriginal people in BC has decreased. Consequently, by 2010 and 2011 the proportion of cases who were identified as Aboriginal was consistent with proportional representation of the provincial population (~5%) (Figure 32).[8] During this same period, the rate of infectious syphilis specifically among First Nations people has also decreased, from >30 per 100,000 to 5.3 per 100,000 population in 2011 (Figure 35). Due to limitations in the availability of population estimates it is not possible to calculate comparable rates for Métis and Inuit cases. (See Technical Appendix for further details about the classification of ethnicity for syphilis cases and First Nations population estimates.)

35. Infectious syphilis case reports among First Nations people in BC by gender, 2002 to 2011



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Reports - Female	26	30	23	29	31	19	12	8	1	2
Reports - Male	8	11	7	10	8	11	13	10	4	5
Reports - Other *	1	1	1	0	0	0	1	0	0	0
Reports - Total	35	42	31	39	39	30	26	18	5	7
Rate - Female	44.7	50.8	38.3	47.5	49.9	30.2	18.8	12.3	1.5	3.0
Rate - Male	14.3	19.3	12.1	16.9	13.3	18.1	21.0	15.9	6.3	7.6
Rate - Total	30.7	36.2	26.3	32.5	31.9	24.2	20.7	14.1	3.9	5.3

* Other - transgender and gender unknown
Rates based on First Nations population estimates from Aboriginal Affairs and Northern Development Canada (AANDC)

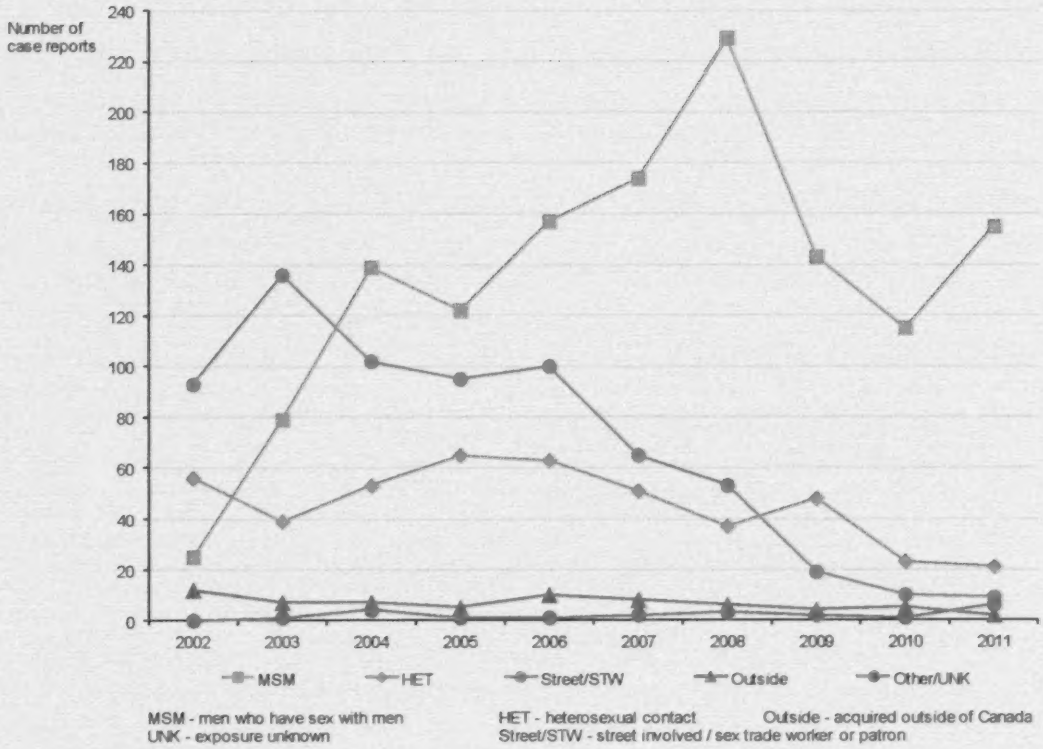
Infectious Syphilis by Exposure Category

Gay, bisexual and other men who have sex with men (MSM) continue to comprise the greatest number of infectious syphilis cases in BC (Figure 37). The number of syphilis cases among MSM increased from 115 cases (74.7% of all cases) in 2010 to 155 cases (80.3%) in 2011. Infectious syphilis cases among heterosexual persons without other risk factors have decreased slightly in recent years from 23 cases (14.9%) in 2010 to 21 cases (10.9%) in 2011. The number of infectious syphilis cases among street involved persons, sex trade workers and their patrons has continued to decrease in recent years (10 cases, 6.5% in 2010 and 9 cases, 4.7% in 2011). Trends among MSM in BC are explored in more detail in the next section.

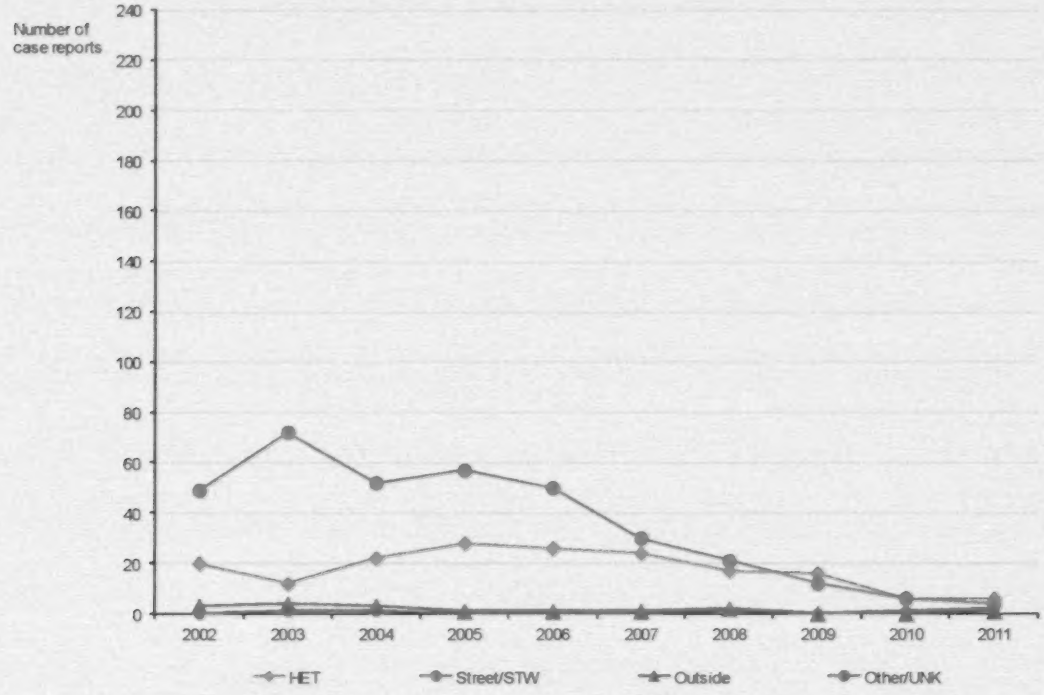
36. Infectious syphilis case reports in BC by exposure category and health authority, 2002 to 2011

Health Authority	Exposure Category	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Interior	MSM	0	1	2	1	2	7	2	5	1	3
	Street/STW	3	2	1	0	1	3	3	1	1	0
	HET	0	1	4	3	2	0	2	7	2	4
	Outside	0	1	0	0	0	0	0	0	0	0
	Other/UNK	0	0	0	0	0	0	0	0	0	0
Fraser	MSM	4	13	13	10	22	13	41	25	17	15
	Street/STW	20	18	25	23	35	23	20	4	2	2
	HET	22	6	16	22	25	21	15	13	5	6
	Outside	2	3	4	3	3	3	5	1	2	0
	Other/UNK	0	0	0	0	1	1	1	0	0	4
Vancouver Coastal	MSM	19	62	123	108	129	136	179	106	94	123
	Street/STW	69	112	74	71	62	34	23	8	7	6
	HET	33	31	30	37	27	15	14	18	13	6
	Outside	10	3	3	2	6	5	1	3	3	2
	Other/UNK	0	0	3	1	0	0	1	1	1	2
Vancouver Island	MSM	0	3	1	1	4	7	6	6	3	13
	Street/STW	1	3	1	1	0	3	3	4	0	0
	HET	0	1	0	2	8	7	2	8	1	3
	Outside	0	0	0	0	1	0	0	0	0	0
	Other/UNK	0	0	1	0	0	0	1	1	0	0
Northern	MSM	0	0	0	0	0	6	1	0	0	1
	Street/STW	0	1	1	0	2	2	4	1	0	1
	HET	1	0	2	1	1	8	4	2	2	2
	Outside	0	0	0	0	0	0	0	0	0	0
	Other/UNK	0	0	0	0	0	0	0	0	0	0

37. Infectious syphilis case reports in BC by exposure category - total, 2002 to 2011



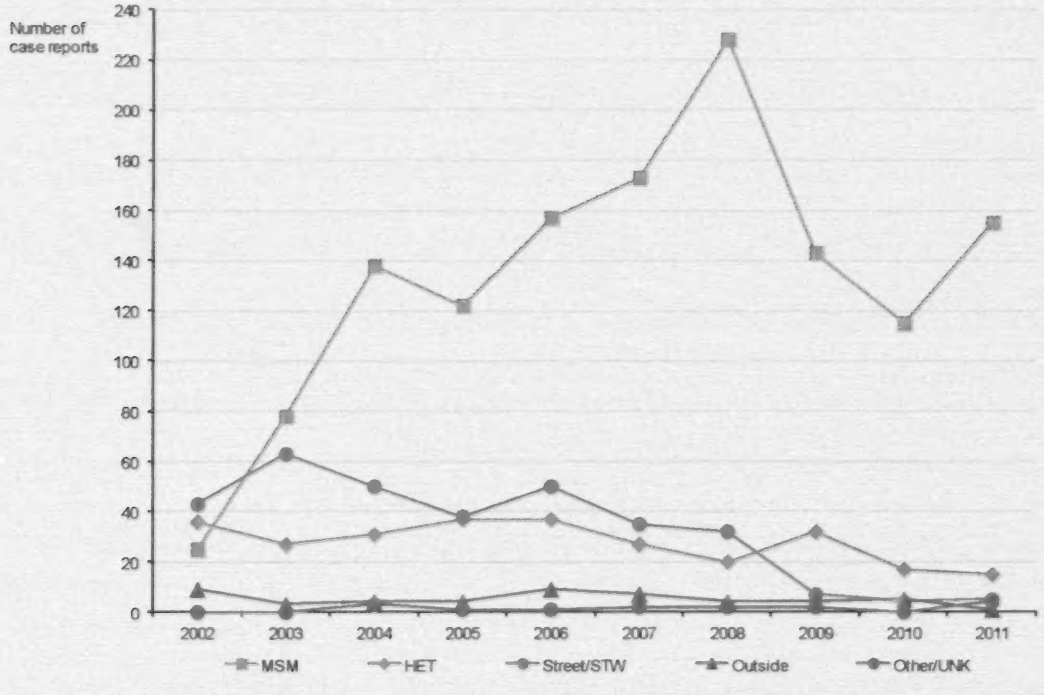
38. Infectious syphilis case reports in BC by exposure category - female, 2002 to 2011



HET - heterosexual contact
UNK - exposure unknown

Outside - acquired outside of Canada
Street/STW - street involved / sex trade worker or patron

39. Infectious syphilis case reports in BC by exposure category - male, 2002 to 2011



MSM - men who have sex with men
UNK - exposure unknown

HET - heterosexual contact
Street/STW - street involved / sex trade worker or patron

Outside - acquired outside of Canada

Infectious Syphilis among Men who have Sex with Men

Gay, bisexual and other men who have sex with men (MSM) continue to be disproportionally affected by the current infectious syphilis epidemic in BC, constituting 79.8% (154 cases) of all cases in 2011 (Figure 37). While cases of infectious syphilis among other exposure categories (i.e., heterosexual persons and street involved/sex trade worker populations) have decreased since 2003, trends among MSM remain elevated, and in 2011 a two-year decreasing trend was reversed. At the time of writing this report (February 2013), preliminary case counts for 2012 suggest this increasing trend has continued. This is similar to the profile of syphilis epidemics in other Canadian provinces, the US and several European countries, where syphilis cases are also predominantly among MSM.[9, 10, 11, 12]

In 2011, there are 154 cases among MSM; 28.6% (44 cases) are diagnosed with primary syphilis, 20.8% (32 cases) with secondary syphilis, and 49.4% (76 cases) are diagnosed with early latent disease. Thirty individuals (19.5%) had had a previous syphilis diagnosis, highlighting the importance of repeat infections in the current epidemic.

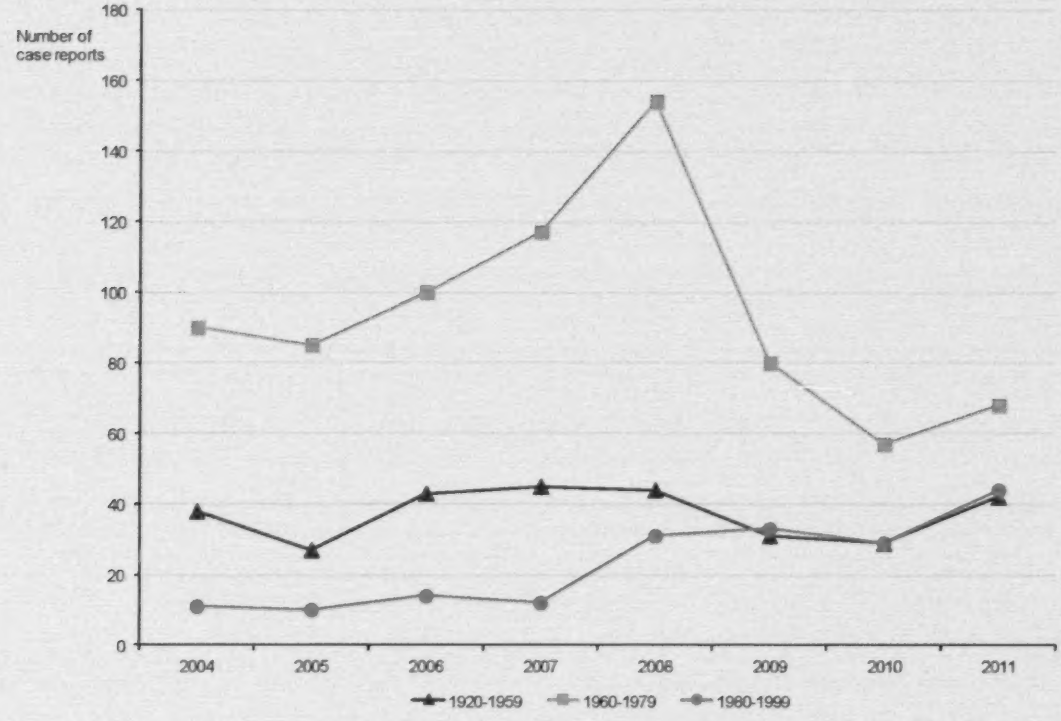
Despite recent fluctuations in the number of annual cases, the characteristics of MSM with syphilis have remained similar over time. The majority of cases reside in the lower mainland with 79.2% (122 cases) in 2011 residing in Vancouver Coastal, 9.7% (15 cases) in Fraser, 8.4% (13 cases) on Vancouver Island and 2.6% (4 cases) in other Health Authorities. As in previous years the majority of cases in 2011 are among Caucasian (93 cases, 60.4%), Asian (11 cases, 7.1%), and Hispanic (10 cases, 6.5%) men (Figure 41).

The mean age of MSM diagnosed with syphilis is 41.7 years (range 18-78 years) in 2011. Prior to 2009 the vast majority of MSM cases were born between 1960-79; however, in more recent years the proportion of cases born between 1980-1989 has increased (Figure 40).

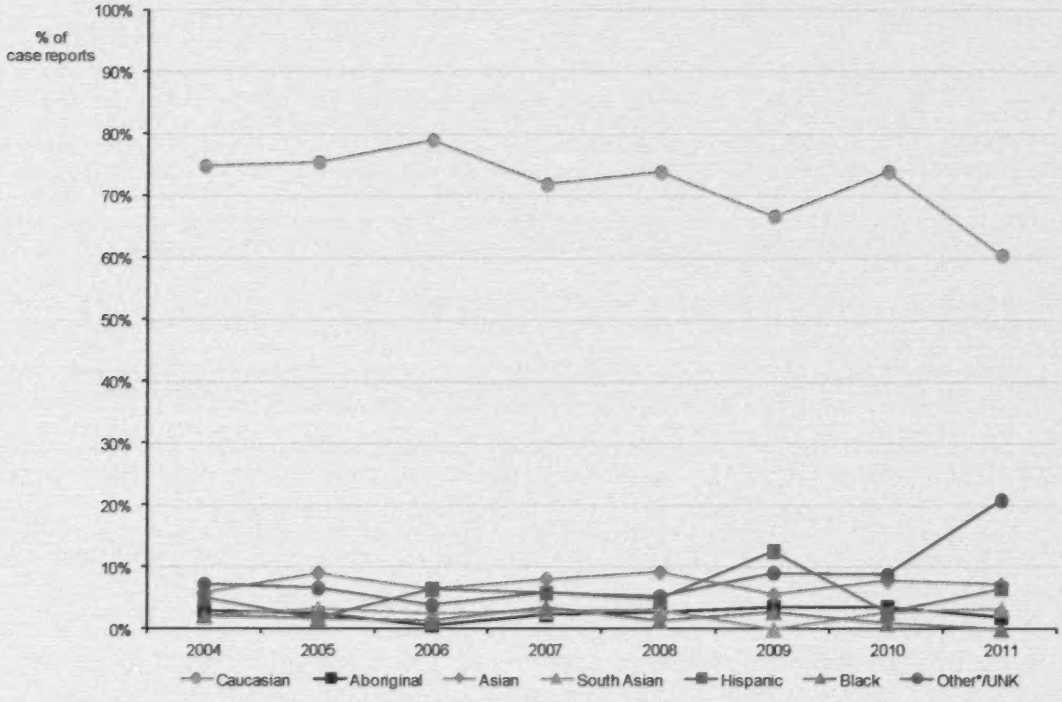
Being HIV positive continues to be an important risk factor for acquiring infectious syphilis. In 2011, of the MSM cases with a known HIV status (146 cases), 53.4% (78 cases) are HIV positive at the time of their syphilis diagnosis, which is consistent with historical trends (Figure 42).

Several factors may be contributing to the ongoing epidemic of infectious syphilis among MSM. Notably, more than half of the syphilis cases among MSM are HIV positive. The possible roles of core sexual networks, and the biological synergy between HIV and syphilis, are important areas of study, which may help explain this trend. While centralized public health follow-up, partner notification, and partner testing for all syphilis cases have continued in recent years, ongoing effectiveness of these strategies may require innovative enhancements, such as new STI testing approaches.

40. Infectious syphilis case reports among MSM in BC by birth cohort, 2004 to 2011

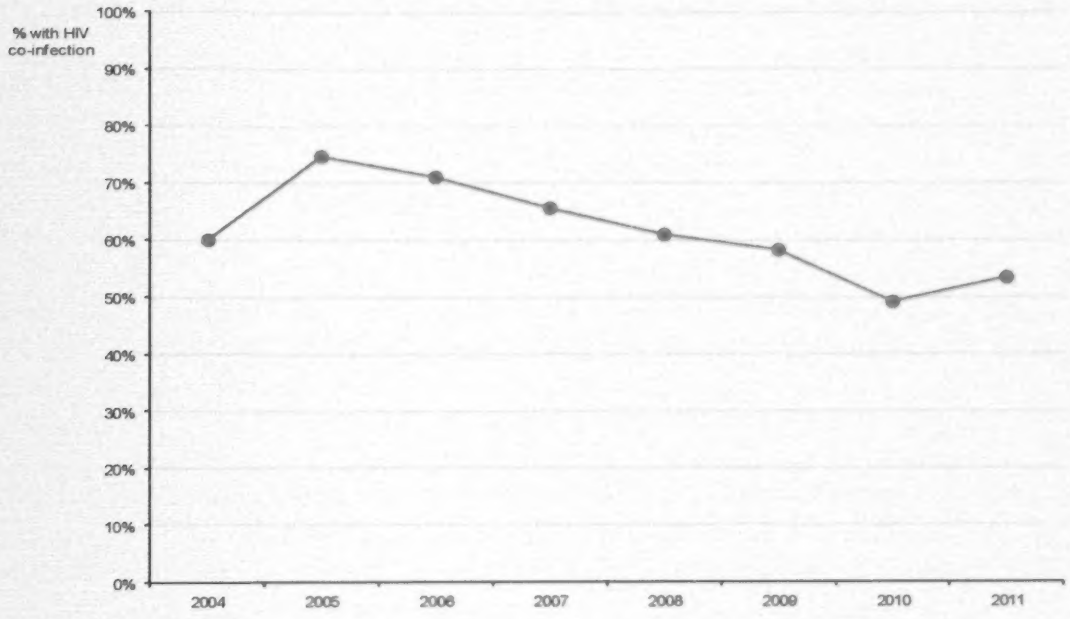


41. Infectious syphilis case reports among MSM in BC by ethnicity, 2004 to 2011



* Other - Arab and other ethnicity
UNK - ethnicity unknown

42. Infectious syphilis case reports among MSM in BC by HIV co-infection, 2004 to 2011

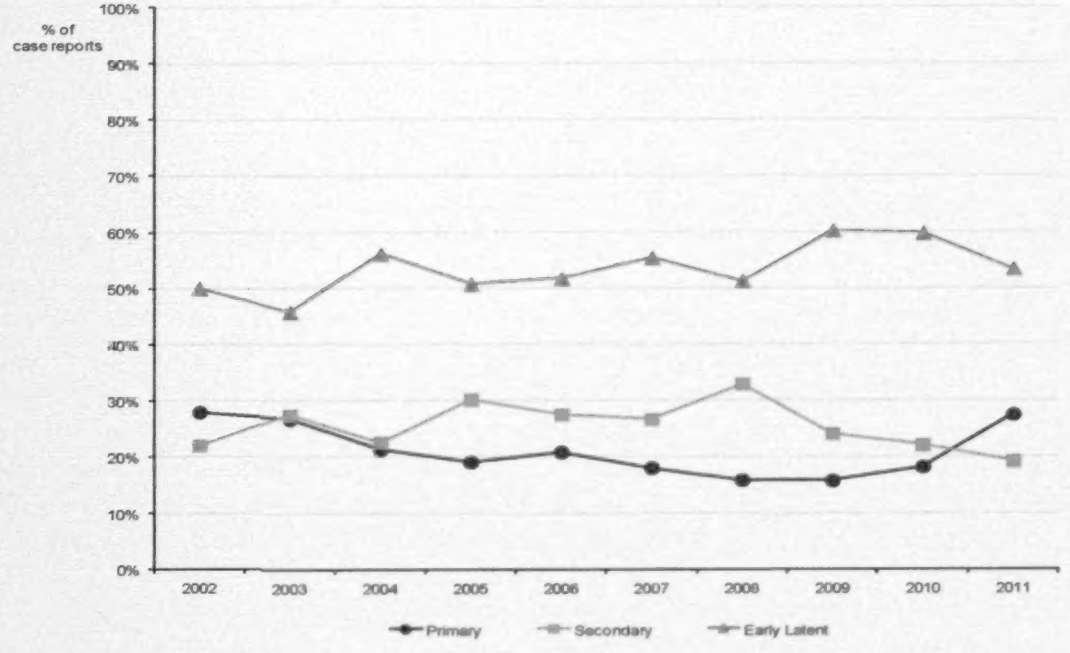


Note: Of those with known HIV status

Stage of Infection at Time of Syphilis Diagnosis

The proportion of infectious syphilis cases by stage of infection (primary, secondary and early latent) has been relatively stable over time. While the proportion of cases that are primary syphilis increased in 2011 to 27.5% (53 cases) from 18.2% (28 cases) in 2010 (Figure 43). This increase is likely year-to-year variation as a preliminary review of 2012 data suggests proportions by disease stage are consistent with overall trend (not shown).

43. Stage of infection at time of syphilis diagnosis, 2002 to 2011

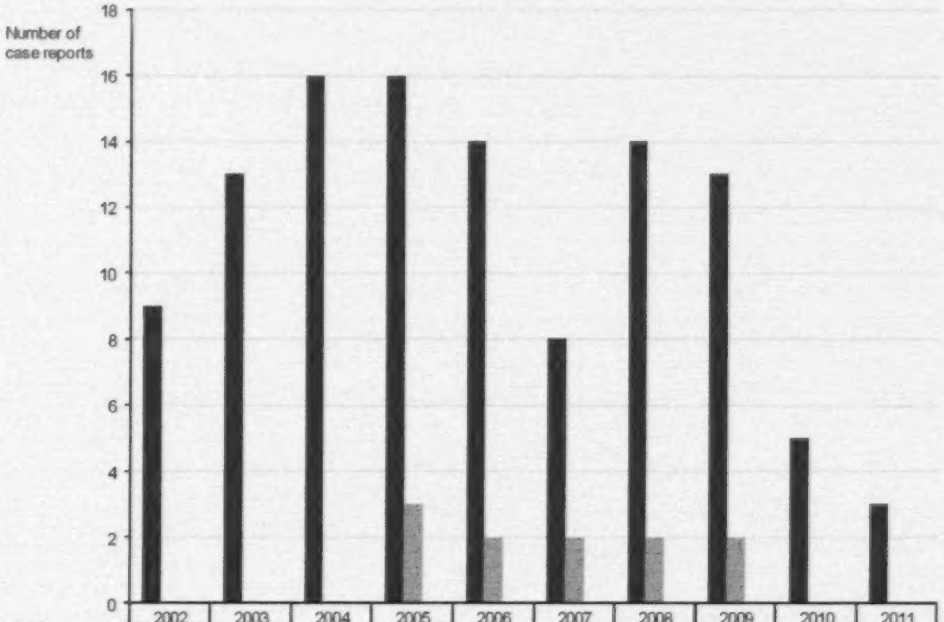


Maternal and Early Congenital Syphilis

Infectious syphilis acquired prior to or during pregnancy can be passed from a mother to her infant, which can have serious consequences including infant death. Accordingly, prenatal screening for syphilis is routinely recommended for all pregnant women in BC, as treatment will reduce the risk of transmission to or complications in infants.

There were no cases of congenital syphilis identified in BC in 2010 and 2011 (Figure 44), which corresponds to the decrease in maternal syphilis cases observed since 2009. In 2011, three maternal syphilis cases are reported, which is lower than in 2010 and is the lowest annual number of cases in the past decade.

44. Maternal and early congenital syphilis case reports in BC, 2002 to 2011



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Reports - Maternal	9	13	16	16	14	8	14	13	5	3
Reports - Early Congenital	0	0	0	3	2	2	2	2	0	0
Rate * - Early Congenital	0.0	0.0	0.0	7.4	4.8	4.6	4.5	4.5	0.0	0.0

* Rate per 100,000 live births

Endnotes

[1] Reference to the "arrested immunity" hypothesis: Brunham RC, Rekart ML. (January 2008). The arrested immunity hypothesis and the epidemiology of chlamydia control. *Sexually Transmitted Diseases, 35*(1), 53-54.

[2] Reference to the "arrested immunity" hypothesis: Rekart ML, Gilbert M, Meza R, Kim PH, Chang M, Money DM, Brunham RC. (2012). Chlamydia public health programs and the epidemiology of pelvic inflammatory disease and ectopic pregnancy. *Journal of Infectious Diseases,* advance access published October 24, 2012. Retrieved from http://jid.oxfordjournals.org/content/early/2012/10/24/infdis.jis644.full.pdf?keytype=ref&ijkey=y7YveY9vcdjbCr2

[3] For more information about lympogranuloma venereum (LGV) in BC: BC Centre for Disease Control. (2012, March). Lymphogranuloma venereum in British Columbia, 2004 to 2011. Retrieved from http://www.bccdc.ca/dis-cond/a-z/_s/SexuallyTransmittedInfections/statsres/default.htm

[4] For more information about the Canadian treatment guidelines for gonorrhea: Public Health Agency of Canada website http://www.phac-aspc.gc.ca/std-mts/sti-its/alert/2011/alert-gono-eng.php

[5] Minimum inhibitory concentration (MIC) breakpoints to define "resistance" to cefixime and ceftriaxone have not yet been established, however, the Clinical and Laboratory Standards Institute (CLSI) defines MIC ≤ 0.25 µg/mL as susceptible.

[6] The US Centers for Disease Control and Prevention (CDC) has proposed MIC ≥2 µg/mL as the non-susceptible threshold for azithromycin.

[7] Reference to the declines in pelvic inflammatory disease and ectopic pregnancy as chlamydia rates are steadily increasing: Brunham RC, Rekart ML. (January 2008). The arrested immunity hypothesis and the epidemiology of chlamydia control. *Sexually Transmitted Diseases, 35*(1), 53-54.

[8] BC Stats. Census Statistical Profiles of Aboriginal Peoples, 2006. Retrieved from http://www.bcstats.gov.bc.ca/statisticsbysubject/AboriginalPeoples/CensusProfiles.aspx

[9] Reference to the increase in infectious syphilis cases among MSM: US Center for Disease Control, 2011. Retrieved from http://www.cdc.gov/std/stats11/syphilis.htm

[10] Reference to the increase in infectious syphilis cases among MSM: Savage EJ, Hughes G, Ison C, Lowndes CM, the European Surveillance of Sexually Transmitted Infections (ESSTI) network. (November 2009). Syphilis and gonorrhea in men who have sex with men: a European overview. *Euro Surveillance,* 14(47). Retrieved from http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19417

[11] Reference to the increase in infectious syphilis cases among MSM: Public Health Agency of Canada. (2009). Executive Summary - Report on sexually transmitted infections in Canada: 2009. Retrieved from http://www.phac-aspc.gc.ca/sti-its-surv-epi/sum-som-eng.php

[12] Reference to the increase in infectious syphilis cases among MSM: Santé et Services Sociaux Québec. (2011). Portrait des infections transmissible sexuellement et par le sang (ITSS) au Québec - année 2010 (et projections 2011). Retreived from http://www.msss.gouv.qc.ca/sujets/prob_sante/itss/index.php?statistiques_au_quebec

[13] Clinical presentation includes any evidence of congenital syphilis on physical examination (e.g., hepatosplenomegaly), evidence of congenital syphilis on radiographs of long bones, a reactive CSF VDRL, an elevated CSF cell count or protein without other cause. Note that neonates may not display clinical manifestations of congenital syphilis and may meet laboratory criteria only.

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Technical Appendix

Data Limitations

There are several key limitations to surveillance data which are important to understand in order to interpret surveillance data appropriately.

- Surveillance data are only reflective of the proportion of the population who test. Individuals with infections who have not tested are not included in the surveillance data presented in this report. Many people with sexually transmitted infections do not have symptoms and so do not seek health care advice or testing. This under-counting of cases may disproportionately affect some groups. For example, more women than men get syphilis testing in BC because of prenatal syphilis screening. Also, some sexually transmitted infections are more or less likely to show symptoms depending on sex and site of infection (e.g., urethral gonococcal infections in men are more likely to produce symptoms than those in women, or those in the pharynx/throat).

- Surveillance trends are also influenced by provider testing behaviours, which may result in changes to the number of tests performed each year (e.g., in 2010-11 increased vigilance for lymphogranuloma venereum may have resulted in more diagnoses of this disease, artificially driving up lymphogranuloma rates). Trends are also influenced by temporal changes in testing technologies. Over the past ten years, nucleic acid amplification tests (NAAT) have gradually replaced culture-based diagnostics for chlamydia and gonorrhea testing. The use of a more sensitive test has resulted in increased detection of these infections. NAAT technology has also allowed urine-based screening for chlamydia and gonorrhea, thus reducing the use of urethral swabs for asymptomatic male clients. With the use of this less-invasive procedure, more men may be getting screened for chlamydia and gonorrhea.

- The majority of surveillance data presented in this surveillance report are extracted from case report forms completed by health care providers or public health nurses as part of the case follow-up process (which includes partner notification, patient education, and referral to appropriate services). There is an expected reporting delay to receipt of these forms, which may range from days to months, depending on the infection.

- Cases are classified by exposure category and ethnicity according to information elicited during follow-up from the case or their health care provider, and under-reporting of this information may lead to misclassification. For example, gay, bisexual and other men who have sex with men, and transgender persons may be reluctant to disclose these factors to their health care providers due to social stigma.

- Rates of infectious syphilis diagnoses among First Nations people are calculated with the numerator comprised of individuals with infectious syphilis who self identify as First Nations and the denominator comprised of individuals who are registered First Nations (see Data Sources, below, for further details).

Case Definitions

Sexually transmitted infections (STIs) included in this report are listed as reportable diseases in the *Communicable Disease Regulation* (Schedule A) of the *Public Health Act*.

Chlamydia

Genital: Detection and confirmation of *C. trachomatis* in anogenital (including rectal) or urinary specimens by appropriate laboratory techniques (e.g., isolation of *C. trachomatis* by culture, demonstration of *C. trachomatis* nucleic acid or antigen).

Extra-genital: Detection and confirmation of *C. trachomatis* in specimens from the conjunctiva, pharynx and other extra-genital sites by appropriate laboratory techniques (e.g., isolation of *C. trachomatis* by culture, demonstration of *C. trachomatis* nucleic acid or antigen).

Perinatally-acquired: Detection and confirmation of *C. trachomatis* in nasopharyngeal or other respiratory tract specimens by appropriate laboratory techniques (e.g., isolation of *C. trachomatis* by culture, demonstration of *C. trachomatis* nucleic acid or antigen) from an infant who developed pneumonia in the first 6 months of life or conjunctival specimens from an infant who developed conjunctivitis in the first month of life.

Gonorrhea

Genital: Detection and confirmation of *N. gonorrhoeae* in anogenital (including rectal) or urinary specimens by appropriate laboratory techniques (e.g., culture, detection of *N. gonorrhoeae* nucleic acid).

Extra-genital: Detection and confirmation of *N. gonorrhoeae* in specimens from the conjunctiva, pharynx, joint, blood and other extra-genital sites by appropriate laboratory techniques (e.g., culture, detection of *N. gonorrhoeae* nucleic acid).

Perinatally-acquired: Detection and confirmation of N. gonorrhoeae infection in the first 4 weeks of life leading to the diagnosis of gonococcal conjunctivitis, scalp abscess, vaginitis, bacteremia, arthritis, meningitis or endocarditis, by an appropriate laboratory technique (e.g., culture, detection of *N. gonorrhoeae* nucleic acid).

Infectious Syphilis

Infectious syphilis is a complex sexually transmitted infection that has a highly variable clinical course. Three stages of syphilis, primary, secondary and early latent, comprise infectious syphilis. Classification by a clinician with expertise in syphilis may take precedence over the following case definitions developed for surveillance purposes.

Primary Syphilis: Current clinical presentation compatible with primary syphilis (e.g., one or more ulcers/chancres), and one of the following:

- Identification of *T. pallidum* in clinical specimens (e.g., from chancre, regional lymph node) by dark field microscopy, direct fluorescent antibody, or nucleic acid amplification test (NAAT), or
- Reactive serology (treponemal, regardless of non-treponemal serology reactivity) in individuals with no previous history of syphilis, or
- Significant (e.g., four-fold or greater) increase in titre over the last known non-treponemal test.

Secondary Syphilis: Clinical presentation compatible with secondary syphilis (e.g., rash, fever, malaise, lymphadenopathy, mucus lesions, condyloma lata, alopecia, meningitis, headaches, uveitis, retinitis, recent hearing impairment), and one of the following:

- Identification of *T. pallidum* in clinical specimens (e.g., from chancre, regional lymph node) by dark-field microscopy, direct fluorescent antibody, or nucleic acid amplification test (NAAT), or

- Reactive serology (non-treponemal and treponemal) in individuals with no previous history of syphilis, or
- Significant (e.g., four-fold or greater) increase in titre over the last known non-treponemal test.

Early Latent Syphilis: An individual without symptoms of primary or secondary syphilis and reactive serology (non-treponemal and treponemal) or four-fold increase in titre over the last known non-treponemal test, and one of the following within the previous 12 months:

- Non-reactive serology, or
- Symptoms suggestive of primary or secondary syphilis, or
- Exposure to a sexual partner with primary, secondary or early latent syphilis, or
- Is a member of (or has had sexual partners in the previous 12 months from) groups at known increased risk of syphilis infection in BC, or
- Has a titre of ≥ 1:16.

Early Congenital Syphilis: A stillbirth, neonate or older individual with clinical presentation[13] compatible with congenital syphilis, onset less than two years of age, and one of the following:

- Four-fold higher RPR than maternal titre and positive treponemal confirmatory test, or
- Detection of *T. pallidum* in clinical specimens (e.g., lesions, placenta, umbilical cord, autopsy) through darkfield microscopy, direct fluorescent antibody assay, or PCR, or
- Mother with untreated or inadequately treated syphilis (primary, secondary, early or late latent syphilis) during pregnancy or at birth.

Maternal Syphilis: A woman who meets the case definition of infectious syphilis (primary, secondary, early latent syphilis) or late latent syphilis, and one of the following:

- Syphilis serology conducted as part of prenatal blood screening, or
- Known to have given birth to an infant (live or stillborn) with congenital syphilis, or
- Clinical presentation with infectious syphilis during pregnancy.

Lymphogranuloma Venereum (LGV)

Confirmed: DNA sequencing for *C. trachomatis* confirming serovars of L1, L2, or L3 present.

Probable: One of the following two case definitions:

i) Positive chlamydia NAAT or culture (from any site), and one of the following:
   - Proctitis, or
   - Inguinal/femoral lymphadenopathy, or
   - Suspicious lesion, or
   - Sexual partner who is confirmed or probable LGV case

ii) Clinical symptoms consistent with LGV (proctitis or inguinal/femoral lymphadenopathy or suspicious lesion) without a positive chlamydia test, and sexual partner who is confirmed or probable LGV case.

Data Sources

STI Data
(Chlamydia, Gonorrhea, Infectious Syphilis)

When an individual is diagnosed with a reportable STI, the care provider completes a case report form (Health 208 form) then forwards it to BCCDC where the information is entered into the provincial STI database. Public health clinics with access to the provincial STI database directly enter the information for their newly diagnosed individuals.

Pelvic Inflammatory Disease and Ectopic Pregnancy Data

The diagnoses of pelvic inflammatory disease (PID) and ectopic pregnancy (EP) are captured in the Discharge Abstract Database (DAD) and the Medical Service Plan (MSP) payment database maintained by the BC Ministry of Health. The DAD includes data on patient discharges and day surgeries directly from hospitals in BC, including all known facilities for acute care

and day surgery, and most facilities for chronic care and rehabilitation. The MSP database contains data on insured medical services delivered on a fee-for-service basis. This data includes physician billings for inpatient and outpatient care, claims from supplementary health care practitioners, and claims for laboratory services and diagnostic procedure. MSP data do not include services provided via an Alternate Payment Program (e.g., contract or salary). Approximately 30% of BC physicians receive some remuneration through alternative payments. In particular, physicians in rural areas are more likely to be paid with Alternate Payment Programs. Some hospital emergency departments in BC also are funded through Alternate Payment Program contracts. Administrative data on PID and EP included in this surveillance report are extracted for women of reproductive age (15-44 years) who have at least one physician billing or hospital discharge per year based on the following International Classification of Disease (ICD) codes:

Pelvic Inflammatory Disease

ICD 9: MSP (1992-2010), DAD (1992-2000)

- Salpingitis and oophoritis (614, 614.0-614.2)
- Parametritis and pelvic cellulitis/ peritonitis (614.3-614.5, 614.7)
- Other or unspecified inflammatory disease of female pelvic organs and tissues (614.8, 614.9)
- Inflammatory diseases of uterus except cervix (615, 615.0-615.9)

ICD 10: DAD (2001-2010)

- Salpingitis and oophoritis (N70, N70.0-N70.9)
- Parametritis and pelvic cellulitis/ peritonitis (N73.0-N73.5)
- Other or unspecified female pelvic inflammatory disease (N73.8, N73.9)
- Inflammatory diseases of uterus except cervix (N71, N71.0-N71.9)

Ectopic Pregnancy

ICD 9: MSP (1992-2010), DAD (1992-2000)

- Ectopic pregnancy (633)
- Abdominal pregnancy (633.0)
- Tubal pregnancy (633.1)
- Ovarian pregnancy (633.2)
- Other or unspecified ectopic pregnancy (633.8, 633.9)

ICD 10: DAD (2001-2010)

- Ectopic pregnancy (O00)
- Abdominal pregnancy (O00.0)
- Tubal pregnancy (O00.1)
- Ovarian pregnancy (O00.2)
- Other or unspecified ectopic pregnancy (O00.8, O00.9)

BC Public Health Microbiology Reference Laboratory located at BCCDC

The BC Public Health Microbiology Reference Laboratory (BCPHMRL) performs approximately 15-20% of all gonorrhea testing in the province, receiving specimens predominantly from Provincial Sexually Transmitted Infection Clinic sites at the BC Centre for Disease Control, regional public health, youth, reproductive, and sexual health clinics and hospitals throughout the province. At BCPHMRL, gonorrhea may be detected by nucleic acid amplification testing (NAAT) or conventional culture diagnostic methods. Culture testing is preferentially used for rectal and pharyngeal specimens, and for all specimens from contacts to gonorrhea as well as patients who are symptomatic, not responding to treatment, or presenting for treatment after an initial NAAT-positive test. Antimicrobial susceptibility testing is routinely performed for all *N. gonorrhoeae* isolated by culture from clinical specimens. The BCPHMRL additionally receives gonorrhea isolates forwarded for susceptibility testing from community or hospital-based laboratories in BC. Antimicrobial susceptibility testing is by E-test (bioMerieux), and data are analyzed by isolate.

Population Data

Unless noted otherwise, population data and associated rates are based on the P.E.O.P.L.E. 36 Population Estimates and Projections released by BC Stats, BC Ministry of Labour and Citizens' Services (September 2011).

First Nations Population Estimates

Population rates for First Nations people are calculated using estimates from Aboriginal Affairs and Northern Development Canada (AANDC, formerly INAC: http://www.aadnc-aandc.gc.ca/).

These estimates are based on the Indian Register, which is subject to several limitations, including:

- Under-counting due to delayed reporting of infants entitled to be registered
- Over-counting due to individuals remaining on the Register after they are deceased
- Geographic misclassification because individuals are included in the BC population according to membership of a BC band rather than current place of residence
- Systematic biases from imbalance in the migration into and out of the BC region (these are difficult to quantify)

For further details about the data source and its limitations, see the report entitled *Registered Indian Population by Sex and Residence, 2011*. Aboriginal Affairs and Northern Development Canada.

Live Births

Perinatal rates are calculated using live births data from the BC Vital Statistics Agency (http://www.vs.gov.bc.ca/stats/annual/2010/index.html).

Additional Notes

Classification of Health Region

Cases are assigned to health regions (i.e., Health Authority or Health Service Delivery Area (HSDA)) by residence. If residence is unknown, the case is assigned to the health region where the individual was tested.

Classification of Ethnicity

Infectious syphilis cases are classified by ethnicity according to information elicited from the case or health care provider during follow-up. Since ethnicity data for chlamydia and gonorrhea cases are often not collected, it is not included in this report.

Ethnicity	Example
Aboriginal*	First Nations, Inuit, Métis
Arab/West Asian	Aremnian, Egyptian, Iranian, Moroccan, Lebanese, Afghani
Asian	Chinese, Japanese, Vietnamese, Cambodian, Indonesian, Filipino, Korean, Laotian
Black	African, Haitian, Jamaican, Somali
Caucasian (White)	Irish, Scottish, English, Portuguese, Italian, Russian
Hispanic	Mexican, Central/South American
South Asian	East Indian, Pakistani, Sri Lankan, Punjabi, Bangladeshi
other/mixed ethnicity	ethnicity is known but is not included in one of the above categories or case has dual ethnicity
unspecified	information about ethnicity is not elicited from case or health care provider

* For infectious syphilis, enhanced case report forms have not included response categories for Inuit or Métis. On this basis, some Métis individuals may have been incorrectly described as First Nations in these surveillance data. Revisions to reporting forms are underway to correct this issue.

Exposure Group Hierarchy

Infectious syphilis cases may belong to more than one exposure category. These individuals are assigned to the exposure category listed first (or highest) in the following hierarchy.

1. **MSM***: Male who reports having male sex partner(s), with or without female sex partners.

2. **Street-Involved, Sex Trade Worker and Patron**:

   i) Street-Involved – Person who reports either: (a) living on the street or in a single room occupancy (SRO) hotel; or (b) attached to the street; or (c) having no fixed address; or (d) transient.
   ii) Sex Trade Worker (STW) – Person who reports providing sex to another individual in exchange for money, shelter, food, drugs, etc.
   iii) Patron of STW – Person who reports payment (with money, shelter, food, drugs, etc.) for sex with a STW.

3. **Heterosexual Contact***: Male who reports having female sex partner(s) only, or female who reports having male with/ without female sex partner(s).

4. **Acquired Outside of Canada**:

   i) Foreign Acquired – Person currently residing in Canada but likely acquired syphilis outside of Canada (i.e., reports sexual partner(s) in other countries).
   ii) Immigration – Person immigrating to Canada and identified with syphilis through testing done as part of the immigration process.

5. **Other Risk Factor:** Likely route of exposure is known but cannot be classified into any of the major exposure categories listed here. For example, females reporting female sex partner(s) only.

6. **Unknown:** Route of exposure is unknown or not identified at the time of completion of case follow-up (e.g., route of exposure not provided by case).

* A transgender individual may be assigned to either exposure category depending on how this individual describes their sexual partners.